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Riley Stoker Corp., Worcester, MA

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PROTOTYPE EVALUATION OF COMMERCIAL SECOND GENERATION LOW-NO_x BURNER PERFORMANCE AND SULFUR CAPTURE

by:

R. A. Lisauskas
D. C. Itse
Riley Stoker Corporation
9 Neponset Street
Worcester, Massachusetts 01606

EPA Contract 68-02-3913

EPA Project Officer

C. C. Masser
Air and Energy Engineering Research Laboratory
Research Triangle Park, North Carolina 27711

AIR AND ENERGY ENGINEERING RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

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16. ABSTRACT

The report gives results of pilot-scale combustion tests of a Riley Stoker second-generation low-NOx burner combined with dry sorbent injection for SO2 control. The burner design is based on the distributed mixing concept. Combustion tests were conducted at 100 million Btu/hr in EPA's Large Watertube Simulator (LWS) test furnace. Results were obtained for three U.S. coals and two sorbents. NOx was reduced up to 60% with this advanced burner design. SO2 was reduced 50% at a Ca/S ratio of 2 with hydrated lime, Ca(OH)2. Highest reductions were achieved when the hydroxide was injected through tertiary air ports on the periphery of the burner. When limestone was used as the sorbent, SO2 capture was about 35% at a Ca/S of 2. In order to aid the scale-up of the pilot-scale results to utility and industrial boilers, two commercial Riley burners were also tested at two scales (100 and 50 million Btu/hr). A furnace heat release parameter was used to extrapolate pilot-scale NOx emissions to operating field boilers. The Riley burner test results are compared with data from other burners also tested in the LWS test facility.

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Burners	Nitrogen Oxides	Stationary Sources	13A	
Coal	Sulfur Oxides	Low-NOx Burners	21D	
Combustion		Dry Sorbent Injection	21B	
Sorbents			11G	
Limestone			08G	

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ABSTRACT

Pilot scale combustion tests were conducted on a Riley Stoker second generation low-NO_x burner combined with dry sorbent injection for SO_2 control. The burner design is based on the distributed mixing concept. Combustion tests were conducted at 100 x 10^6 Btu/hr in the EPA's Large Watertube Simulator (LWS) test furnace. Results were obtained for three different U.S. coals and two sorbents.

Up to 60% reduction in NO_x was achieved with this advanced burner design. SO_2 reductions of 50% at a Ca/S ratio of 2 were obtained with hydrated lime ($Ca(OH)_2$). Highest reductions were achieved when the hydroxide was injected through tertiary air ports located on the periphery of the burner. When limestone was used as the sorbent, SO_2 capture was on the order of 35% at a Ca/S of 2.

In order to aid the scale-up of the pilot scale results to utility and industrial boilers, two commercial Riley burners were also tested at two different scales (100 and 50 x 10^6 Btu/hr). A furnace heat release parameter was used to extrapolate pilot scale NO_x emissions to operating field boilers. In addition, the Riley burner test results are compared with data from other burners also tested in the LWS test facility.

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SECTION 1

INTRODUCTION

The emphasis of U.S. energy policy has been on the expanded use of coal in utility and industrial applications. Because of the characteristics of coal and its combustion, this may result in the increase of pollutant emissions, including NO_x and SO_x. The reduction of NO_x, SO_x, and particulate emissions from fossil fuel fired boilers has been a major objective for the U.S. EPA and all of the major boiler burner manufacturers for several years. This is evidenced by a number of unrelated concurrent efforts that have been and are being conducted to develop low-NO_x burners. Various EPA programs have demonstrated the principle of staged combustion as a means of controlling NO_x emissions from coal-fired combustion systems, and have defined design guidelines for the Distributed Mixing Burner (DMB) concept as a viable control technology for new and retrofit applications.

Riley Stoker Corporation (RSC) is engaged in a corporate research program to develop efficient firing systems which will reduce pollutant emissions from coal-fired boilers. Corporate funds have been expended to develop low-NO_x coal burners for retrofit in existing boilers. The RSC Controlled Combustion Venturi (CCV) burner evolved from this corporate commitment with tests in the Medium Tunnel facility at Energy and Environmental Research Corporation's (EER) test site. The CCV burners have been installed in three full size utility boilers including CILCO Duck Creek Unit 1. The NO_x emissions with these retrofit burners were 40 to 60 percent lower than the originally installed Flare burners(1). This program provided the opportunity to share in these development efforts and to compare information from low-NO_x firing systems installed in utility boilers and tested in the EPA Large Watertube Simulator (LWS) experimental facility at EER.

In the last several years the EPA has developed a low-NO_x pulverized coal burner for wall-fired applications. This distributed mixing burner consists of a circular burner surrounded by outboard tertiary air ports. The DMB concept involves local staging of the combustion process to minimize NO_x emissions while maintaining an overall oxidizing atmosphere in the furnace so as to have minimal impact on furnace slagging and corrosion. NO_x production from fuel nitrogen compounds is minimized by devolitizing the majority of the coal into the gas phase under fuel-rich conditions and providing a stoichiometry/temperature history which maximizes the decay of the evolved nitrogen compounds to N_2. Thermal NO_x production is also minimized by delaying heat release in the fuel-rich zone which reduces peak temperatures.

A schematic representation, illustrating how the DMB design sequentially stages the fuel and air mixing, is shown in Figure 1-1. The combustion process occurs in three zones. In the first zone pulverized coal transported by the primary air combines with the inner secondary air to form a very fuel-rich (30 to 50 percent theoretical air) recirculation zone which provides flame stability. The coal devolatilizes, and fuel nitrogen compounds are released to the gas phase. Outer secondary air is added to the second "burner zone" where the stoichiometry increases up to about 70 percent theoretical air.

These burner zone stoichiometries have been found to be the optimum range for reduction of fuel-bound nitrogen compounds to N_2(2). Air to complete the combustion process is supplied through tertiary ports located outside the burner throat. This allows substantial residence time in the burner zone for decay of bound nitrogen compounds to N_2 and radiative heat transfer to reduce peak temperatures. The tertiary ports surrounding the burner throat provide an overall oxidizing atmosphere in the burner zone.

LIMB-Limestone Injection Multistage Burners was coined to describe the potential simultaneous NO_x/SO_x control using limestone injection with a distributed mixing burner. It was originally thought that the conditions by which NO_x emissions were reduced with the DMB concept might also enhance the capture of sulfur species with calcium-based sorbents.

The lower flame temperature within the low-NO_x DMB flame tends to reduce the degree of deactivation of sorbent materials and thus may enhance sorbent reactivity. Injection in the burner region allows for improved dispersion and mixing of the sorbent particles in the furnace. In addition, the extended reducing conditions in the low-NO_x flame could contribute sulfur capture under fuel-rich conditions.

This experimental program represents one part of an ongoing series of EPA-sponsored investigations designed to evaluate the performance of second generation low-NO_x burners, and to compare the results of these individual studies. The objectives of this program were to:

1. Optimize and characterize the performance of the RSC DMB.

2. Optimize the operation of the RSC DMB for combined NO_x/SO_x control with sorbent injection.

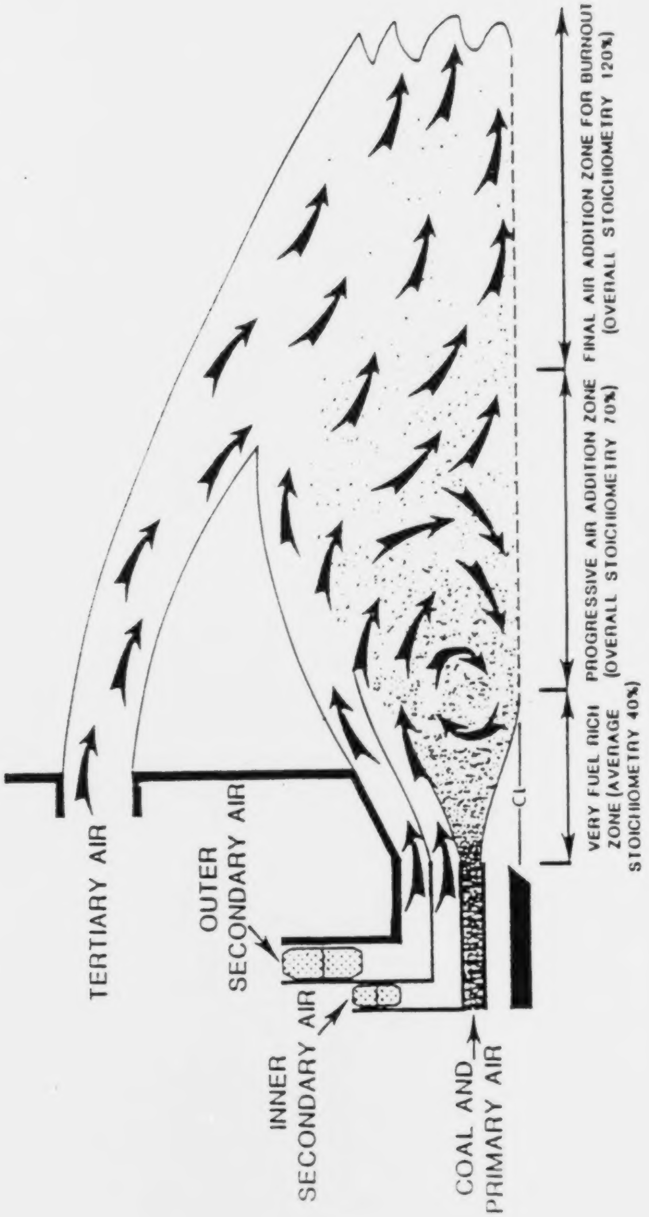

TERTIARY AIR
OUTER SECONDARY AIR
INNER SECONDARY AIR
COAL AND PRIMARY AIR
CL
VERY FUEL RICH ZONE (AVERAGE STOICHIOMETRY 40%)
PROGRESSIVE AIR ADDITION ZONE (OVERALL STOICHIOMETRY 70%)
FINAL AIR ADDITION ZONE FOR BURNOUT (OVERALL STOICHIOMETRY 120%)

Figure 1-1. DMB Concept

3. Provide a comparative evaluation of commercial RSC burners in the LWS with field operation.
4. Project RSC DMB performance to a wide range of utility and industrial boilers.

These objectives were accomplished in two series of tests in the LWS. The RSC DMB was optimized for combined NO_x/SO_x reduction in the first series of tests. The performance of the DMB was first optimized with a parametric series of adjustments to burner operating variables. The DMB was then characterized over operating ranges typical of field installations. The SO_2 reduction potential of the RSC DMB was evaluated with two sorbents and two injection configurations.

The second series of tests consisted of evaluating the performance of two RSC commercial burner designs, the Flare and CCV, at two scales, 100 and 50 x 10^6 Btu/hr, in the LWS. Testing of these RSC burners enabled direct comparison with previous pilot-scale tests conducted in EER's MT, Riley Stoker's CBTF and with results from operating boilers. To evaluate SO_x control potential with commercial burners, limited sorbent injection tests were also conducted with the Flare and CCV burners.

SECTION 2

EXPERIMENTAL SYSTEMS

The evaluation of the RSC second generation low-NO_x burner involved testing five RSC pulverized coal burners in the EPA LWS at EER. The burners included:

- 50 x 10^6 Btu/hr Flare burner
- 100 x 10^6 Btu/hr Flare burner
- 50 x 10^6 Btu/hr Controlled Combustion Venturi burner
- 100 x 10^6 Btu/hr Controlled Combustion Venturi burner
- 100 x 10^6 Btu/hr Distributed Mixing burner

The Flare and CCV burners represent the currently available commercial RSC designs for wall-fired boilers. The performance of these two commercial burner designs has been well characterized in both research facilities, including EER's Medium Tunnel (MT) and RSC's Coal Burner Test Facility (CBTF), and an operating utility boiler, CILCO Duck Creek Unit 1.

Characterizing the performance of the Flare and CCV burners in the LWS would thus provide a basis for evaluating the prototype RSC DMB in terms of burner operating range, flame stability and shape, and emissions. Emissions and burner performance were determined with three coals, including the two coals used at EER for combined NO_x/SO_x control studies, Utah and Indiana coals, and the CILCO Duck Creek coal from Illinois. Testing with these coals allows direct comparison with previous work in EER research facilities and also an operating boiler.

SO_2 reduction potential was evaluated for selected burner conditions with three different, processed materials: limestone, hydrated lime, and dolomite. The tests were conducted in the LWS in accordance with the procedures described in the Quality Assurance Project Plan.

2.1 RSC TEST BURNERS

2.1.1 Flare Burner

The Flare burner, shown in Figure 2-1 is a scaled-down version of original equipment 156 x 10^6 Btu/hr burners installed at CILCO. Two Flare burners were tested with firing capacities of 100 x 10^6 Btu/hr and 50 x 10^6 Btu/hr. The burners were geometrically scaled to the respective firing rates by maintaining the same full load velocities as the burners in the field. This assured that pressure drops, swirl numbers, and other related flow parameters are similar to the original burner.

The coal and primary air enter the burner downward at a 45° angle from vertical through a coal head which is connected to an axial coal nozzle. The coal head is equipped with adjustable vanes which produce a uniform coal distribution in the nozzle. An impeller-type spreader, located at the end of the nozzle, imparts swirl to the coal and primary air, thus providing for rapid mixing with the secondary air. The spreader is a high-density, multiple vane design which imparts a high degree of swirl to the coal stream to produce an intense, stable flame. Secondary air from the windbox passes through an adjustable single-register for swirl control and into an annular secondary air passage surrounding the coal nozzle. The register is normally set at 30 to 60 degrees open for field operation so that a compact, swirl-stabilized flame is produced. The burner exit is formed from a castable refractory.

2.1.2 Controlled Combustion Venturi Burner

The Controlled Combustion Venturi (CCV) burner, also shown in Figure 2-1, was developed by RSC at EER in 1980 as a retrofit technique for NO_x reduction(1). Two CCV burners were tested, with design firing capacities of 50 x 10^6 and 100 x 10^6 Btu/hr geometrically scaled in the same manner as the Flare burners. The 50 x 10^6 Btu/hr CCV burner, as well as the 50 x 10^6 Btu/hr Flare burner, was previously tested in the Medium Tunnel (MT) at EER's test facility. The CCV burner design is currently installed at CILCO Duck Creek Unit 1.

The key design feature of the CCV burner is the coal nozzle configuration illustrated in Figure 2-2. The coal nozzle is narrower than that of the Flare burner, with a venturi installed at the tip. The smaller diameter nozzle and the venturi effectively increase the coal/primary air velocity and tend to concentrate the coal particles toward the center of the coal pipe prior to reaching the conically shaped coal spreader. The impeller-type spreader, located at the end of the spreader, imparts swirl to the coal and primary air mixture providing for mixing with the secondary air.

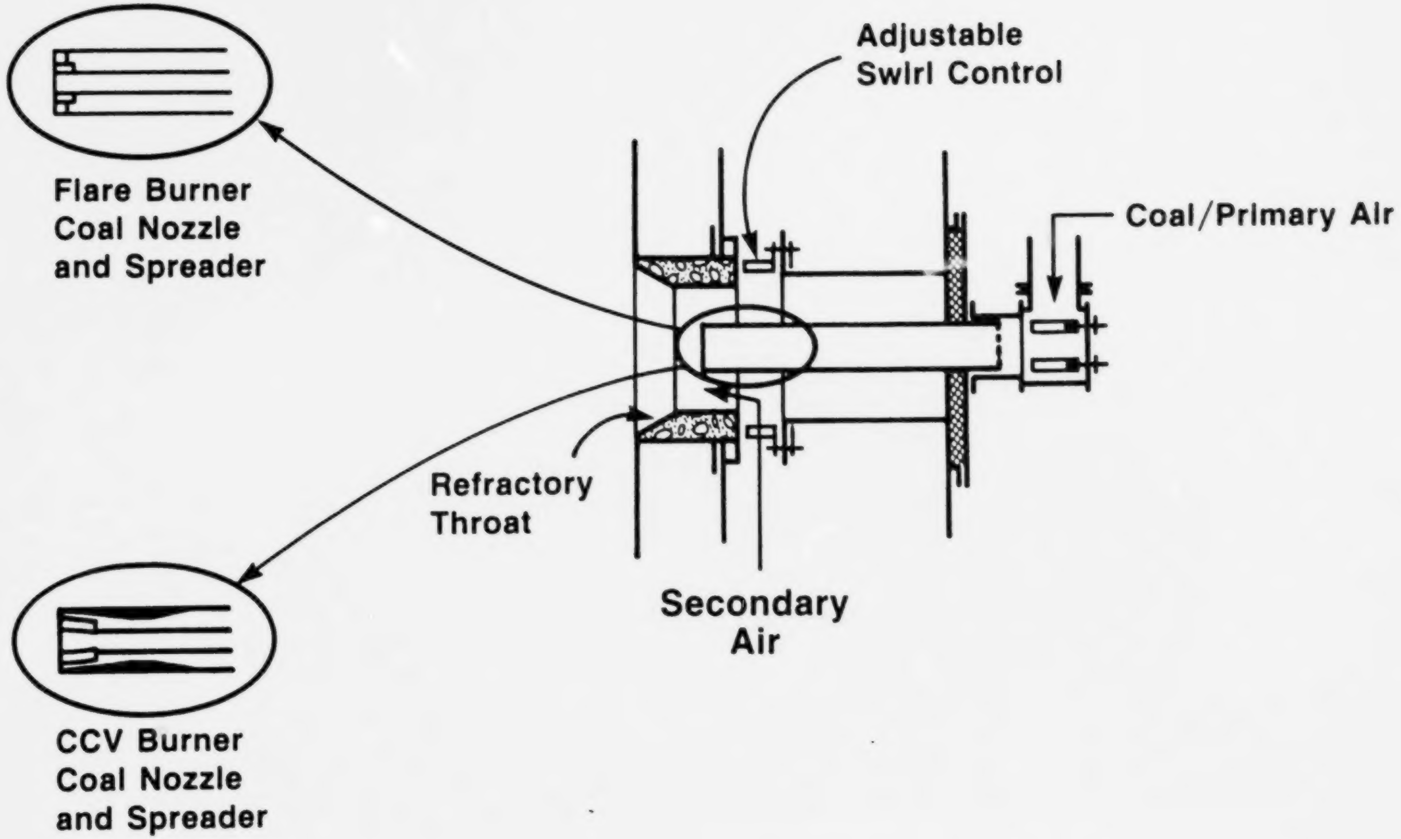

Adjustable Swirl Control
Coal/Primary Air
Flare Burner Coal Nozzle and Spreader
Refractory Throat
Secondary Air
CCV Burner Coal Nozzle and Spreader

Figure 2-1. Riley Stoker Flare and CCV*Burners

* Protected by U.S. Patent No. 4,479,442

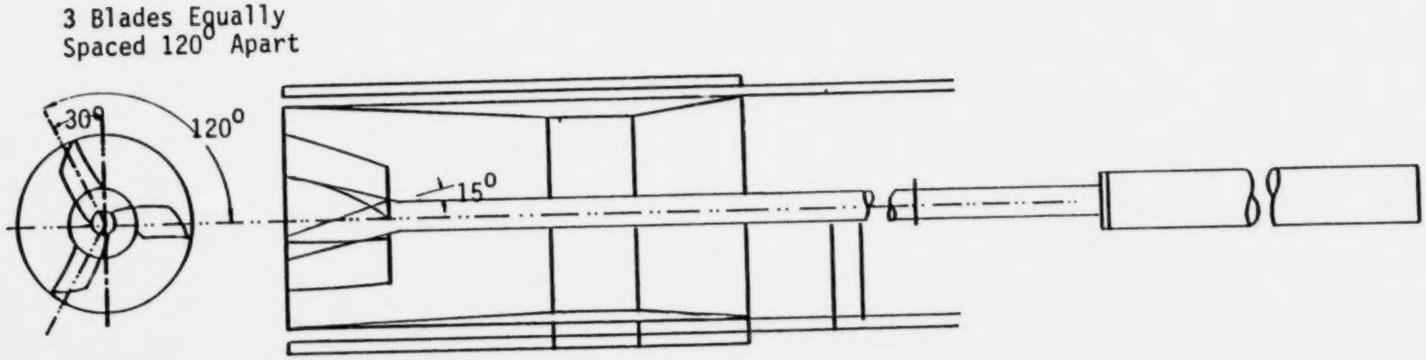

3 Blades Equally
Spaced 120° Apart
30°
120°
15°

Figure 2-2. Controlled Combustion Venturi Coal Spreader Arrangement

As with the Flare burner, the single secondary air passage is equipped with an adjustable register for swirl control. Although the CCV burner is normally operated unstaged, four ports located radially 1.8 throat diameters from the burner centerline were installed with the 100 x 10^6 Btu/hr CCV burner to provide for tertiary, or staging, air for these tests.

2.1.3 RSC DMB Design

The RSC DMB was based on EPA DMB design criteria(2). The design of the burner is shown in Figure 2-3. The following RSC burner components were incorporated into the design:

- Retractable Coal Spreader
- Telescoping Venturi Coal Nozzle
- Dual Parallel Registers for Swirl Control
- Divided Windbox to Separate Inner and Outer Secondary Air
- Tertiary Ports With Removable Inserts
- Peabody Gas Ignition System
- Commercial 2-Color Flame Scanner

This DMB utilized burner components and hardware similar to the RSC commercial burners. The coal and primary air enter the burner through a coal-head which is connected to an axial coal nozzle. The coal-head is equipped with adjustable vanes to produce a uniform coal distribution in the nozzle. The telescoping nozzle adjusts the primary setback within the burner throat. The venturi-shaped nozzle accelerates the coal stream through the throat of the venturi, tending to concentrate the coal particles in the center of the coal pipe prior to reaching the coal spreader. An impeller-type spreader, located at the end of the nozzle, imparts swirl to the coal and primary air, providing for mixing with the secondary air.

There are two concentric secondary air passages supplied from individual windboxes. Each air passage is equipped with an adjustable register for swirl control. The separate windboxes, which were incorporated as an experimental expedient, facilitate remote control of the air flows from the furnace control room. Tertiary or staging air is supplied from four separate ports evenly spaced around the burner exit. Tertiary inserts (8, 10, 12 inches in diameter) permit evaluation of a range of tertiary velocities which are a factor of 2 to 4 higher than specified by the DMB criteria. These higher velocities should provide for improved flame stability with enhanced mixing by jet entrainment with some sacrifice in NO_x emissions.

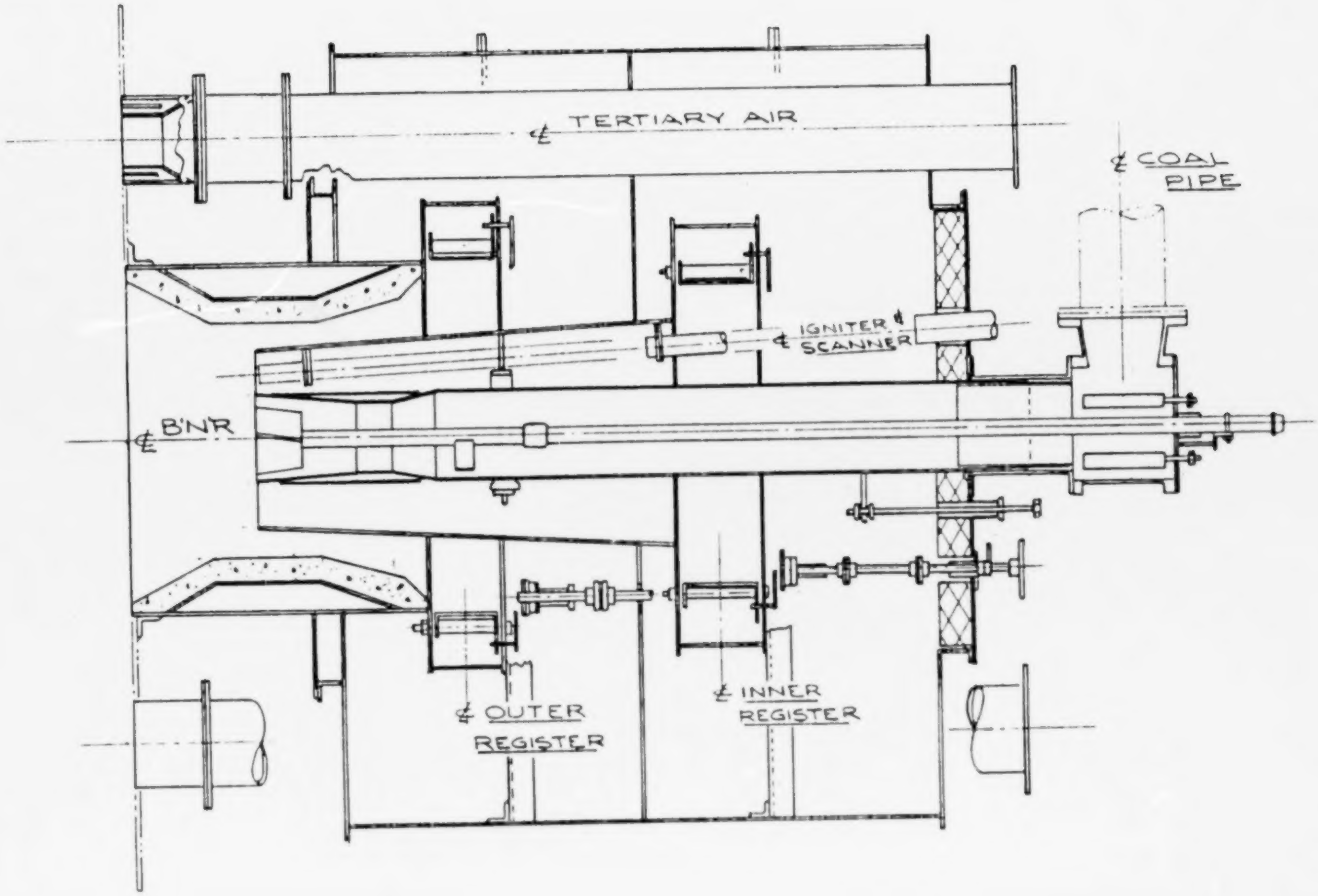

℄ TERTIARY AIR
℄ COAL PIPE
IGNITER ℄
℄ SCANNER
℄ B'NR
℄ OUTER REGISTER
℄ INNER REGISTER

Figure 2-3. Riley Stoker Distributed Mixing Burner

A retractable gas ignition system including spark ignition, is located 16 inches radially from the burner centerline at 60°. The two-color flame scanner is located 16 inches below the burner horizontal centerline. Both items are commercial systems and enable verification of compatibility of commercial equipment with the prototype DMB.

The RSC DMB design parameters generally match those for the 50 x 10^6 Btu/hr RSC Low-NO_x burner tested previously in the MT and the EPA DMB design parameters(3). There are several differences which may be significant. First, the ratio of the radius from the burner centerline to the centerline of the tertiary ports to the throat diameter is 1.80 for the RSC DMB compared to 2.2 as specified by the DMB parameter and 1.44 for the 50 x 10^6 Btu/hr Low-NO_x burner. The ports for the Low-NO_x burner were arranged to minimize the impact on the structural integrity of a boiler's firing face, with three closely spaced small diameter ports located above and below the burner exit. These differences in the distribution of tertiary air around the burner may affect performance.

The geometry of the secondary air passages for the RSC DMB and the low-NO_x burner is also different. First, the secondary flow divider setback from the exit differs. The RSC DMB secondary divider setback-to-throat diameter is 0.18, while for the 50 x 10^6 Btu/hr Low-NO_x burner it was 0.24. This difference may offset the mixing and flow patterns. However, the longer exit length for the RSC DMB should provide for added stability.

Also, to accommodate the igniter/scanner system, the inner secondary air passage for the RSC DMB is formed by a converging section. The converging section may affect the swirl generated by the register vanes differently than the constant cross-section utilized for the smaller Low-NO_x burner. These hardware differences could be expected to produce different mixing patterns and thus the extrapolation of burner performance, by scaling the results from the low-NO_x burner to the RSC DMB to field units may not be justifiable.

2.2 SPREADER DESIGN

During the optimization tests of the CCV and the DMB, several iterative modifications were made in the design of the coal spreader. Previous tests at EER with RSC burners indicated that NO_x emissions could be changed by a factor of two by modifying the spreader design. The baseline spreader used for the CCV and DMB test series was the conical spreader which was developed for the CCV. Figure 2-4 shows a sketch of the spreader.

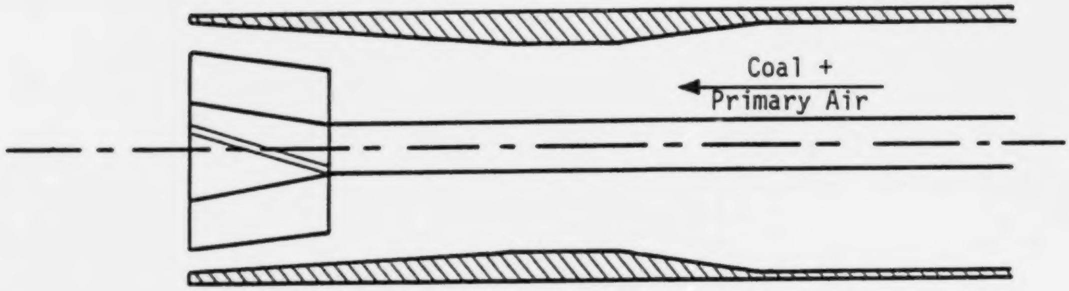
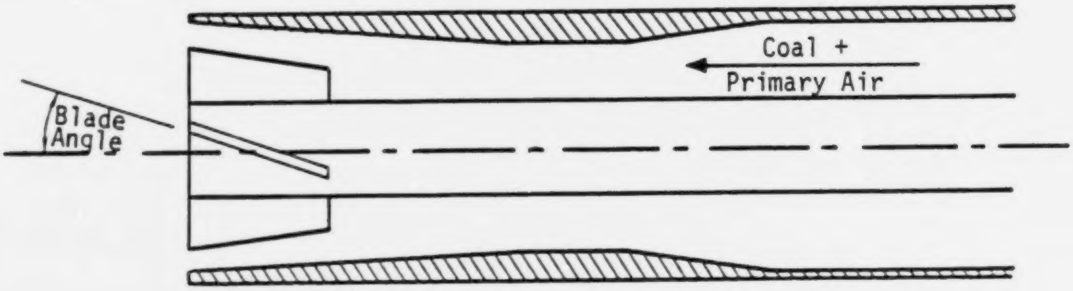

Coal +
Primary Air

Figure 2-4. Spreader #1--Controlled Combustion Venturi Spreader for Riley Stoker Corporation Distributed Mixing Burner.


Coal +
Primary Air
Blade Angle

Burner	Spreader Design	Number of Blades	Blade Angle	Blade Length
DMB	2	4	15°	Long
DMB	3	4	35°	Long
DMB	4	4	35°	Short
DMB, CCV	5	4	28°	Short
CCV	5L	4	28°	Long

Figure 2-5. Impeller designs based on 4-in. support tube for Riley Stoker Corporation CCV and DMB

The remaining spreaders were based on a 4-inch diameter support tube. This large diameter body increased the primary velocity through the venturi nozzle, further concentrating the coal stream and improving the dispersion of the coal with the impeller blades. These designs are summarized in Figure 2-5.

The initial spreader modifications were made during the DMB test series. Iterative changes were made due to combustion problems related to unacceptable flame length and stability or due to process system problems related to high coal head pressures which impaired pulverizer operation. The final optimum design utilized during the DMB tests was Spreader #5.

For the CCV tests, Spreader #5 was used as the second spreader design. Spreader #5L was also tested with the CCV. This spreader was developed at RSC and had been used in the CBTF. The principle difference of the two spreaders was in the length of the blades, with spreader #5L having blades about twice as long as Spreader #5. For the 50 x 10^6 Btu/hr CCV, the baseline cone and Spreader #5L were used. In each case, the spreaders were scaled down to maintain the same velocities achieved with the full scale burner.

2.3 FUELS AND SORBENTS

Three different fuels were utilized during the RSC burner tests in the LWS. Table 2-1 summarizes the composition of these coals from the first test series, the RSC DMB, and the second series, the commercial RSC burners. The bowl mills used for these tests pulverized each of the coals to acceptable fineness, 70 percent through 200 mesh. The range of fineness achieved during the tests is listed in Table 2-2.

The Utah coal, from the Starpoint 1 and 2 mines in Wattis, Utah, has been used at EER as the base fuel for most of the low-emission, high efficiency burner development tests, therefore allowing the comparison of the RSC burner performance with a wide data base of other burners. Its characteristics include low sulfur content, 0.74-0.75 percent*, and high-volatile matter, 40.47-43.86 percent.

Indiana coal has been used as the base fuel in the development of LIMB technology at EER because of its medium range of sulfur content, 2.73 percent. It is significantly lower in volatiles, 34.3 percent, compared to Utah coal and would test the applicability of the RSC burners to various coals. Indiana coal was used only during the DMB test series.

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* Coal composition is reported on a dry basis

TABLE 2-1. SUMMARY OF COAL COMBUSTION FOR RSC BURNER TESTS

Coal	Utah				Illinois						Indiana	
	DMB		Commercial		DMB		Commercial[1]		Commercial[2]		DMB	
Reporting Basis	As Rec'd	Dry	As Rec'd	Dry	As Rec'd	Dry	As Rec'd	Dry	As Rec'd	Dry	As Rec'd	Dry
Proximate (% Wt):												
Moisture	5.46	0.00	5.60	0.00	10.66	0.00	12.25	0.00	10.52	0.00	7.75	0.00
Ash	10.00	10.57	8.01	8.48	9.37	10.49	9.10	10.37	10.13	11.32	9.17	9.94
Volatile	38.26	40.47	41.40	43.86	34.51	38.62	34.19	38.97	33.72	37.68	31.60	34.26
Fixed C	46.28	48.96	44.99	47.66	45.46	50.89	44.46	50.66	45.63	51.00	51.48	55.80
Sulfur (% Wt)	0.70	0.74	0.70	0.75	3.54	3.97	3.48	3.97	3.18	3.55	2.52	2.73
Btu/lb	11,930	12,619	12,334	13,066	11,265	12,609		11,561		11,251	11,498	12,465
MMF Btu/hr		14,269		14,408		14,349		13,118		12,903		14,048
MAF Btu/lb		14,111		14,277		14,086		12,898		12,686		13,841
Ultimate (% Wt)												
Moisture	5.46	0.00	5.60	0.00	10.66	0.00	12.25	0.00	10.52	0.00	7.75	0.00
Carbon	67.59	71.50	68.61	72.68	61.99	69.38	57.95	66.04	57.44	64.19	66.42	72.00
Hydrogen	5.09	5.38	5.06	5.36	4.54	5.08	4.05	4.62	3.87	4.32	4.56	4.95
Nitrogen	1.21	1.28	1.28	1.36	0.96	1.08	1.19	1.36	0.94	1.05	1.10	1.19
Sulfur	0.70	0.74	0.70	0.75	3.54	3.97	-	2.91	-	2.45	2.52	2.73
Ash	10.00	10.57	8.01	8.48	9.37	10.49	9.10	10.37	10.13	11.32	9.17	9.94
Oxygen*	9.95	10.53	10.74	11.37	8.94	10.00	11.98	13.64	13.92	15.57	8.48	9.19
Elemental Ash (% Wt)												
SiO_2		66.17		63.55		49.45		49.39				43.08
Al_2O_3		16.49		20.12		17.28		17.97				23.79
TiO_2		0.68		0.89		0.68		0.64				0.49
Fe_2O_3		4.95		3.66		18.41		19.92				27.85
CaO		3.72		4.11		4.33		3.06				1.16
MgO		0.87		1.03		0.83		1.07				0.20
Na_2O		1.27		1.07		1.40		0.95				0.17
K_2O		2.11		1.18		2.15		2.10				0.65
P_2O_5		0.30		0.41		0.18		0.28				0.22
SO_3		3.07		3.79		4.31		4.16				0.19
Forms of Sulfur (% Wt)												
Sulfate				0.01								
Pyritic				0.13								
Organic				0.62								

*Oxygen by difference.

[1] Mixed Illinois coal.

[2] Illinois From 1980 test.

TABLE 2-2. SUMMARY OF COAL FINENESS DURING RSC BURNER TESTS

Coal Type	Range of Size Distribution (% Through 200 Mesh)		Mean (% Through 200 Mesh)		Standard Deviation (% Through 200 Mesh)	
	RSC DMB	Commercial	RSC DMB	Commercial	RSC DMB	Commercial
Utah	61.0-77.2	71.06-84.8	71.32	77.83	3.93	4.28
Indiana	70.6-72.4	---	71.57	---	0.91	---
Illinois	69.3-72.0	72.5-88.61	70.65	79.30	1.91	8.34

The Illinois coal from the Crown 11 mine in Virden, Illinois, is the coal fired at the CILCO Duck Creek Station. The CILCO Station was the basis for previous tests at EER of RSC burners and the use of the Illinois coal will permit extrapolation of test results in EER's facilities to an operating utility boiler. The Illinois coal has a high sulfur content normally, 3.97 percent, and provides the opportunity to evaluate LIMB technology for high sulfur fuels. The volatile content is high, 37.7-39.0 percent, similar to the Utah coal.

There was relatively little change in the composition of the Utah coal used for the two phases of testing. Any difference probably resulted from shipments approximately a year apart. There was a significant difference in the composition of the Illinois coal used during the two test series, oxygen content increased from 10 percent, dry to 13.64-15.57 percent, dry. The Illinois coal used during the DMB tests also had a higher sulfur content, 3.97 percent, which is more representative of that used at the power plant than the sulfur content of the coal used during the commercial burner tests, 2.45-2.91 percent.

This degradation of coal quality was due to several factors. First, coals stored over time are exposed to physical weathering which may act to effectively "clean" the coal, or in this case decrease the sulfur content and heating value significantly. Also, during the storage period between the two test series, several coal fires occurred in the coal piles. These fires typically occur during hot weather and effectively reduce the heating value and may reduce the sulfur content by partial oxidation.

Prior to the start of the commercial burner test series, it was determined that there was insufficient Illinois coal to complete the required tests. Therefore to increase the Illinois coal supply, the DMB Illinois coal was mixed with an Illinois coal from the same mine that was used in 1980 for a previous RSC test series at EER. Both coals had degraded similarly so mixing of the two coals would not further decrease the coal quality. Since there was a larger amount of the 1980 Illinois, a mix of about 2:1 was used of the 1980 to the DMB Illinois coals.

Mixing occurred at the coal supply hopper by alternately dumping two loads of the 1980 Illinois and one load of the DMB Illinois. This provided the most economical means of mixing the two coals. Coal samples of the mixed coal were obtained at the coal sample platform, which is downstream of the pulverizer. The relatively large coal inventory retained in the pulverizer, approximately five minutes, provided an opportunity for intimate mixing of the two coals. Therefore, taking coal samples after the pulverizer provided a fuel sample representative of the fuel being fired. The DMB Illinois supply was exhausted during the CCV tests, so testing of the full-scale Flare and 50 x 10^6 Btu/hr CCV burner was completed using the 1980 Illinois coal.

Three sorbents were used during these tests to evaluate SO_2 reduction potential. For both the DMB and commercial burner test series, a processed limestone, Vicron 45-3, and a processed hydrated lime were used. Due to encouraging results from previous bench-scale LIMB tests, dolomite was used as an alternate sorbent for selected test conditions during the CCV burner test series. The characteristics of these materials are listed in Table 2-3 and the corresponding size distributions are shown in Figure 2-6.

Vicron and hydrated lime are commercially available high-calcium materials used in the development of LIMB technology at EER. Vicron 45-3 is 98-99 percent pure $CaCO_3$, while the hydrated lime is 91-96 percent pure $Ca(OH)_2$. Mass median diameters were 9.8-11 μm and 4.0 to 7.0 μm, respectively. The dolomite was a pre-ground, processed magnesium and calcium carbonate material, with a mass mean diameter of 12.0 μm. The use of these processed materials minimizes interferences due to impurities, although the commercial use of such processed materials may not be economically feasible.

2.4 TEST FACILITIES

The RSC DMB, CCV, and Flare burners were tested in the EPA LWS test facility at EER's test site. The LWS is a 150 x 10^6 Btu/hr combustor, shown schematically in Figure 2-7. The furnace is designed to match the size and geometry of a large industrial or small utility single wall-fired boiler. The LWS characteristics are listed in Table 2-4. Specific instrumentation and process equipment utilized during testing were operated and maintained in accordance with the Quality Assurance Program Plan (QAPP) described in Appendix A.

TABLE 2-3. SUMMARY OF SORBENT CHARACTERISTICS

a) Distributed Mixing Burner Test Series

		Physical Properties			Elemental Ash (Wt %)							
Sorbent	Chemical Formula	Median Diameter (μm)	Density (gm/cm^3)	LOI @ 1000°C (Wt %)	CaO	Fe_2O_3	Al_2O_3	Na_2O	MgO	K_2O	SiO_2	CrO_2
Vicron 45-3	$CaCO_3$	11.0	2.757	44.0	54.9	0.05	0.17	0.03	0.80	0.01	0.15	0.01
Hydrated Lime	$Ca(OH)_2$	7.0	2.353	26.4	68.42	0.23	0.67	0.05	0.42	0.16	2.31	0.01

b) Commercial Burner Test Series

		Physical Properties			Elemental Ash (Wt %)									
Sorbent	Chemical Formula	Median Diameter (μm)	Density (gm/cm^3)	LOI @ 1000°C (Wt %)	CaO	Fe_2O_3	Al_2O_3	Na_2O	MgO	K_2O	SiO_2	TiO_2	P_2O_5	SO_3
Vicron 45-3	$CaCO_3$	9.8	2.706	42.49	55.64	0.08	0.03	0.01	0.54	<0.01	0.20	<0.01	0.01	0.02
Hydrated Lime	$Ca(OH)_2$	4.0	2.279	22.91	72.67	0.15	0.40	0.01	0.42	0.06	7.06	0.02	0.01	0.07
Dolomite	$CaCO_3 \cdot MgCO_3$	12.0	2.871	45.83	34.67	0.13	0.08	<0.01	18.79	<0.01	0.35	<0.01	0.02	<0.01

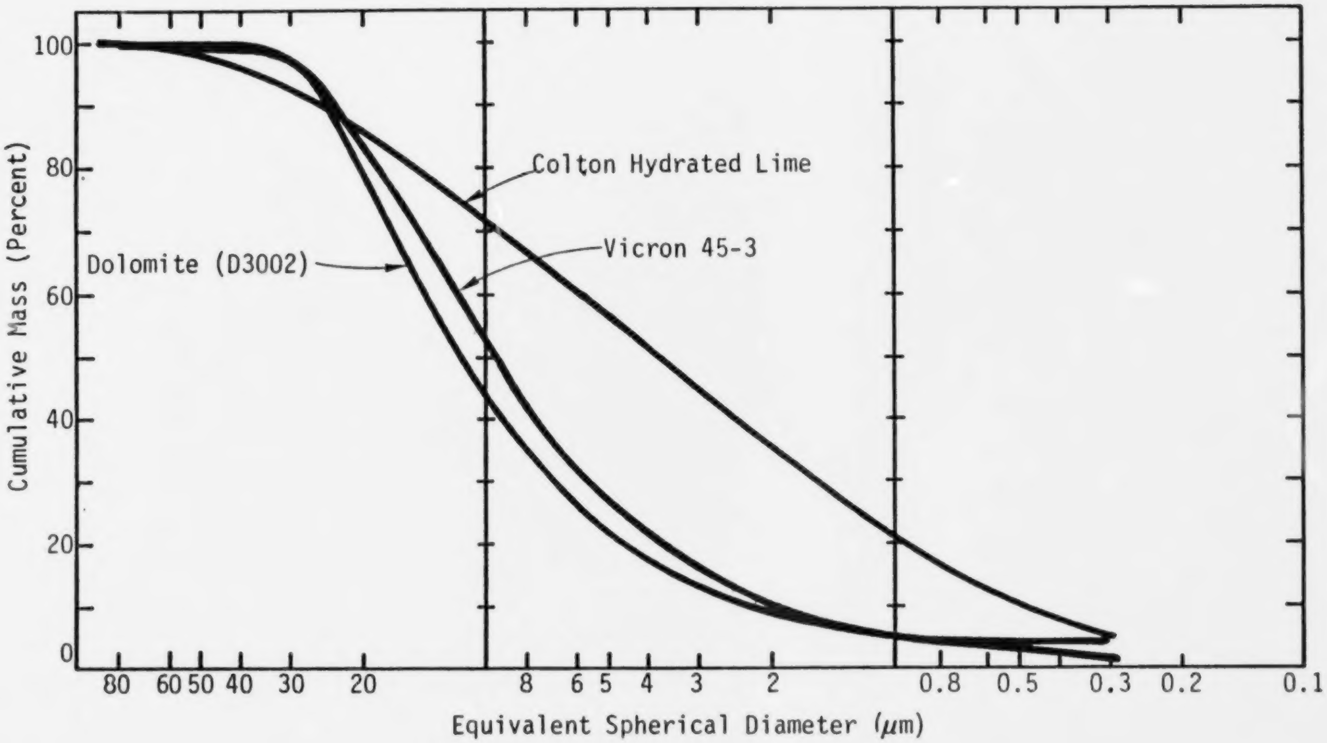


Figure 2-6. Sorbent Particle Size Distributions

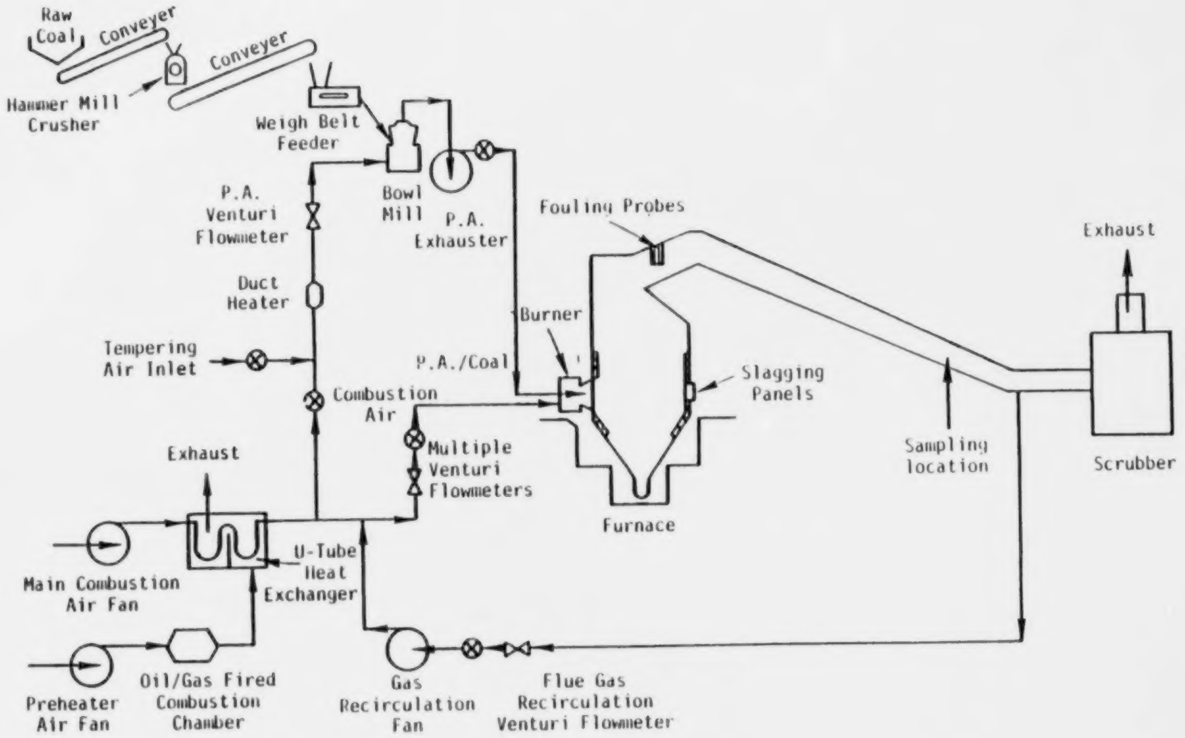

Raw Coal
Conveyer
Hammer Mill Crusher
Conveyer
Weigh Belt Feeder
Bowl Mill
P.A. Exhauster
P.A. Venturi Flowmeter
Duct Heater
Tempering Air Inlet
Combustion Air
P.A./Coal
Burner
Fouling Probes
Slagging Panels
Furnace
Multiple Venturi Flowmeters
Exhaust
Main Combustion Air Fan
U-Tube Heat Exchanger
Preheater Air Fan
Oil/Gas Fired Combustion Chamber
Gas Recirculation Fan
Flue Gas Recirculation Venturi Flowmeter
Sampling location
Exhaust
Scrubber

Figure 2-7. Large Watertube Boiler Simulator System Schematic

TABLE 2-4. LWS FURNACE CHARACTERISTICS

Parameter		Value
Firing		
Configuration	Primary	Single Wall
	Optional	Opposed or Corner
Firing Rate	Minimum	50×10^6 Btu/hr (Practical Limit)
	Maximum	150×10^6 Btu/hr
Dimensions		
Firing Depth		22 ft
Width		16 ft
Rear Wall Height		20 ft
Knuckle-to-Nose Height		27.5 ft
Nose Angle		37° (From Horizontal)
Hopper Angle		52° (From Horizontal)
Height Above Ground Level		35.7 ft
Total Vertical Height		50.5 ft (Pit-to-Top)
Cooled Surface Area		
Burner Zone		704 ft^2
Total Furnace		1951 ft^2
Volume		
Burner Zone		3520 ft^3
Total Furnace		11,544 ft^3 (to Nose)
Insulation		All Sidewalls Knuckle-Up 16 ft
Cooling		Spray-Cooled on All Surfaces

2.5 TEST PROCEDURES

A parametric test matrix was designed to provide a comprehensive evaluation of the RSC burners. The tests for each burner were divided into two major series--burner optimization and characterization, and SO_x reduction potential. Table 2-5 lists the burner parameters tested during each series. Specific tests each day were conducted to most effectively characterize the burner performance.

Procedures applied to the tests were grouped into the following formats.

- Standard (Routine) Measurement Format. Routine measurements applied to all test conditions (Table 2-6).
- Detailed Measurement Format. Additional measurements applied to specific test conditions to more fully characterize performance (Table 2-7).

Test procedures utilized were in accordance with guidelines set by the QAPP. Specific quality assurance activities are detailed in Appendix A. Auxiliary systems which are unique in design to the LWS/RSC DMB system are as follows:

1. Sorbent injection system.
2. High-volume grab sampler.
3. SO_2 sample system.

The sorbent injection system, as shown in Figure 2-8, consists of a volumetric feeder, hopper, and air injection system. The feeder is a commercial volumetric twin screw feeder manufactured by K-tron. The air injection system consists of a compressor, venturi to monitor flow, and injectors. The sorbent was injected at two locations, directly at the outlet of the pulverizer or through a four-way splitter into the tertiary air ports. Sorbent was injected through pipes located on the axis of each tertiary air port. The injection pipes used were 1.25 in schedule 80 with an internal diameter of 1.278 in.

The volumetric feeder was calibrated with each sorbent material to determine the rate of sorbent flow for a range of feeder speeds. In addition, during each injection test, direct feed rate was determined by mounting the feeder and hopper assembly on a scale to determine weight change over time.

TABLE 2-5. TEST SERIES FOR RSC BURNERS

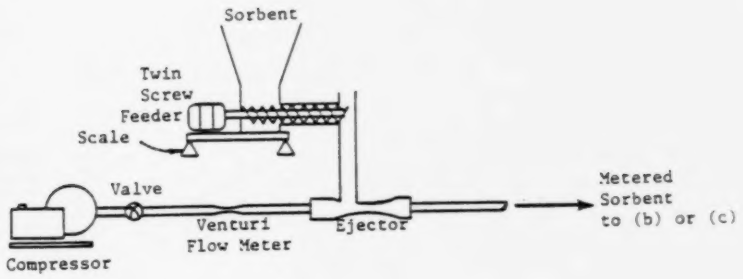
Burner	Test Series	Parameters Tested	Objective
RSC DMB	Burner Optimization/ Characterization	1) Burner Settings 2) Spreader Design 3) Excess Air 4) Staging 5) Tertiary Velocity 6) Turndown Capability 7) Fuel Type 8) Temperature Profile	NO_x optimization; characterize overall burner performance
	SO_x Optimization	1) Sorbent Type 2) Sorbent Injection Location 3) Injection Velocity	Establish SO_x reduction potential using sorbent injection
CCV 100	Burner Optimization/ Characterization	1) Burner Settings 2) Spreader Design 3) Excess Air 4) Staging 5) Turndown Capability 6) Fuel Type	NO_x optimization; characterize overall burner performance; provide data base for field extrapolation
	SO_x Optimization	1) Sorbent Type 2) Sorbent Injection Location	Establish SO_x reduction potential using sorbent injection
Flare 50, 100; CCV 50	Burner Optimization/ Characterization	1) Burner Settings 2) Excess Air 3) Fuel Type	NO_x optimization; characterize overall burner performance; provide data base for field extrapolation
	SO_x Optimization	1) Sorbent Type 2) Sorbent Injection Location	Establish SO_x reduction potential using sorbent injection

TABLE 2-6. STANDARD MEASUREMENT FORMAT

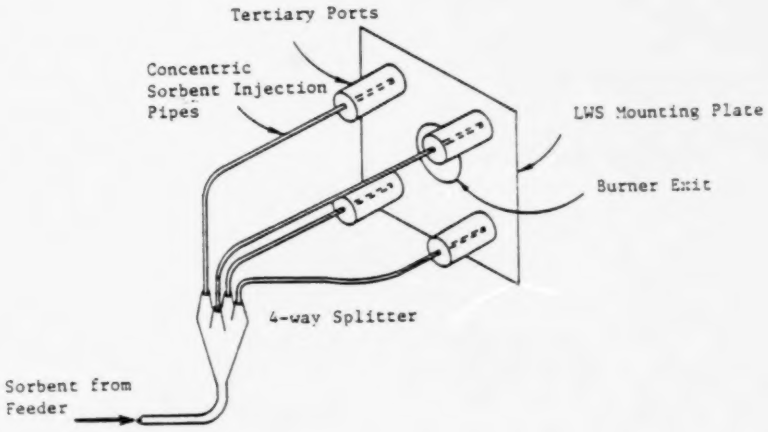
Inputs			Outputs		
Parameter	Method	Record	Parameter	Method	Record
Burner Settings	Manual	Manual	Flame Characteristics	Manual and Color Video	Manual
Air Flow Rates	Venturis	Computer	Combustion Products:		
Air Temperature	Thermocouples	Computer	O_2	Beckman Paramagnetic	
Coal Flow Rate	Weigh Belt Feeder and Calculation from Coal Composition, Air Flow and Excess O_2	Computer	CO	Anarad, NDIR Strip Chart	Computer and
			CO_2	Anarad, NDIR	Recorder
Sorbent Injection Location	Manual	Manual	NO_x	TECO, Chemiluminescent	
Sorbent Flow Rate	Volumetric Feeder	Manual	SO_2	DuPont, NDUV	
Ambient Humidity	Sling Psychrometer	Manual	Burner/Furnace Pressures	Magnehelics	Manual
			Furnace Temperature	Thermocouples	Computer
			Particulate Composition	High-Volume Sampler	Manual

TABLE 2-7. DETAILED MEASUREMENT FORMAT

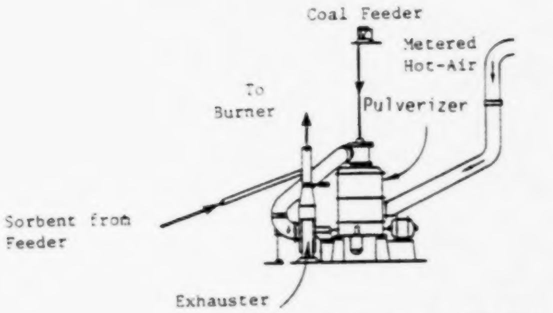
Inputs		Outputs	
Parameter	Method	Parameter	Method
Coal Composition	Ultimate and Proximate Analysis--ASTM	Particulate Matter: Total Mass	EPA Method 5
		Composition	Ultimate Analysis--ATSM
Coal Size Distribution	ASTM Method D197	Combustion Efficiency:	
Sorbent Composition	ASTM Methods	CO, CO_2	Standard Measurement Format
Sorbent Size Distribution	SediGraph Particle Size Analyzer	Particulate	Ultimate Analysis
		Calcium Utilization:	
		SO_2	Continuous Monitor UV and/or EPA Method 6
		SO_3	Controlled Condensation and EPA Method 8
		Particulate	Ultimate Analysis
		Slagging Characteristics	Water-Cooled Slagging Panels
		Fouling Characteristics	Fouling Probes


Sorbent
Twin Screw Feeder
Scale
Valve
Venturi Flow Meter
Ejector
Compressor
Metered Sorbent to (b) or (c)

a) Sorbent Feed System


Tertiary Ports
Concentric Sorbent Injection Pipes
LWS Mounting Plate
Burner Exit
4-way Splitter
Sorbent from Feeder

b) Sorbent Injection through Tertiary Air Ports


Coal Feeder
Metered Hot-Air
To Burner
Pulverizer
Sorbent from Feeder
Exhauster

c) Sorbent Injection with Coal

Figure 2-8. Schematic Representation of Sorbent Injection System

The high-volume sampler, shown in Figure 2-9, was to collect particulate or fly ash samples. A large exhaust gas sample from the center of the LWS exhaust duct is drawn into the baghouse via an insulated, flexible duct. The particulate is collected on the bags, which are intermittently pulsed with compressed air, causing the sample to be forced into the collection container.

The SO_2 sample system, shown in Figure 2-10, was utilized during the commercial burner tests. A phase discrimination probe is used. This probe is designed to effectively separate particulate matter in the sample gas from the sample that passes through the SO_2 analyzer. This separation minimizes the SO_2 scrubbing effect caused by particulate in the gas stream when sorbent is present.

The partially cleaned sample passes through a heated sample line, a heated filter, and a commercial permeation tube dryer installed upstream of the instrument, to polish the gas sample of any moisture or remaining particulate matter while avoiding any scrubbing reactions. Therefore, the SO_2 measurement is determined on a dry basis. The remaining central stream of the gas sample passes through a condenser and delivers a sample for the remaining instruments.

The permeation tube dryer was not included as part of sample system used during the RSC DMB tests. Instead, the entire SO_2 sample system was maintained at temperatures above the flue gas dewpoint to prevent any condensation. Therefore, SO_2 was measured on wet basis during the first phase.

To correlate SO_2 concentrations between the two phases, it would be necessary to correct the absolute concentrations measured wet to a dry basis by using the following relationship:

$$\text{ppm (dry)} = \text{ppm (wet)} \times \frac{100\%}{(100\% - \%\text{ moisture in stack gas})}$$

Although correction for moisture changes the absolute concentration of SO_2, there is no change in percent reduction due to sorbent injection. All calculations were determined on a consistent basis, either wet or dry, for the corresponding testing series.

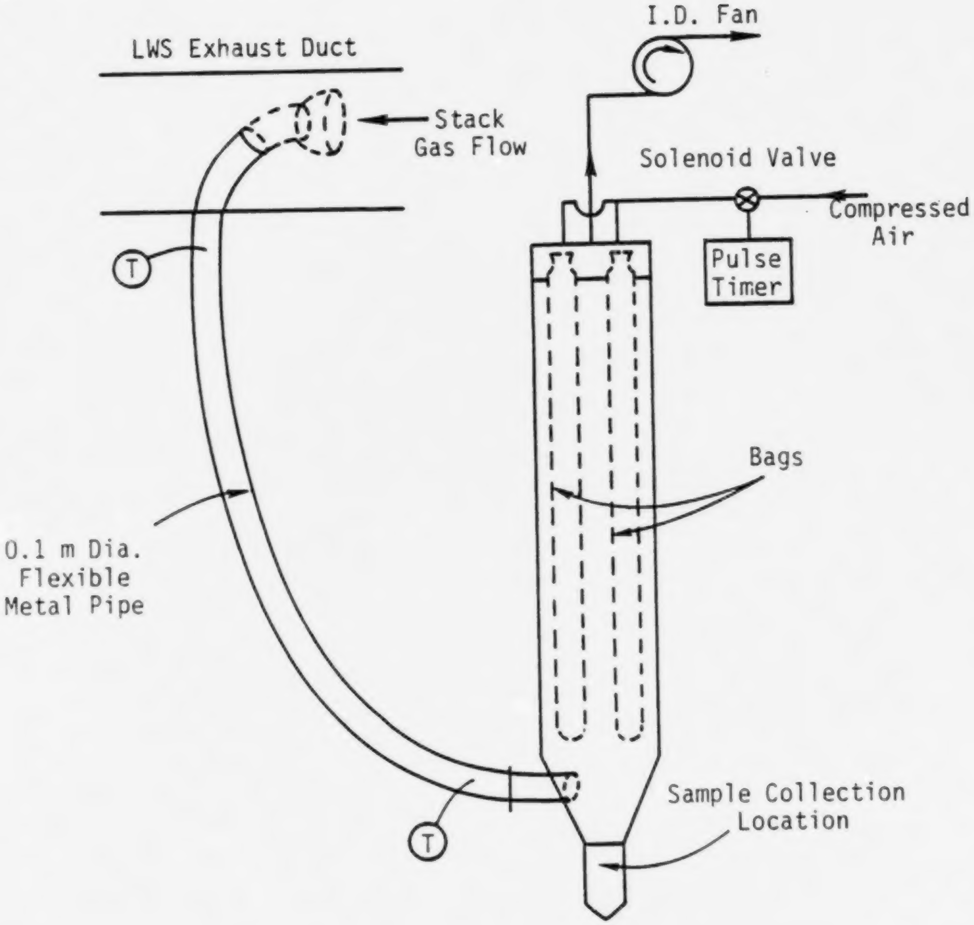

I.D. Fan
LWS Exhaust Duct
Stack Gas Flow
Solenoid Valve
Compressed Air
T
Pulse Timer
Bags
0.1 m Dia. Flexible Metal Pipe
Sample Collection Location
T

Figure 2-9. High-Volume Sampler

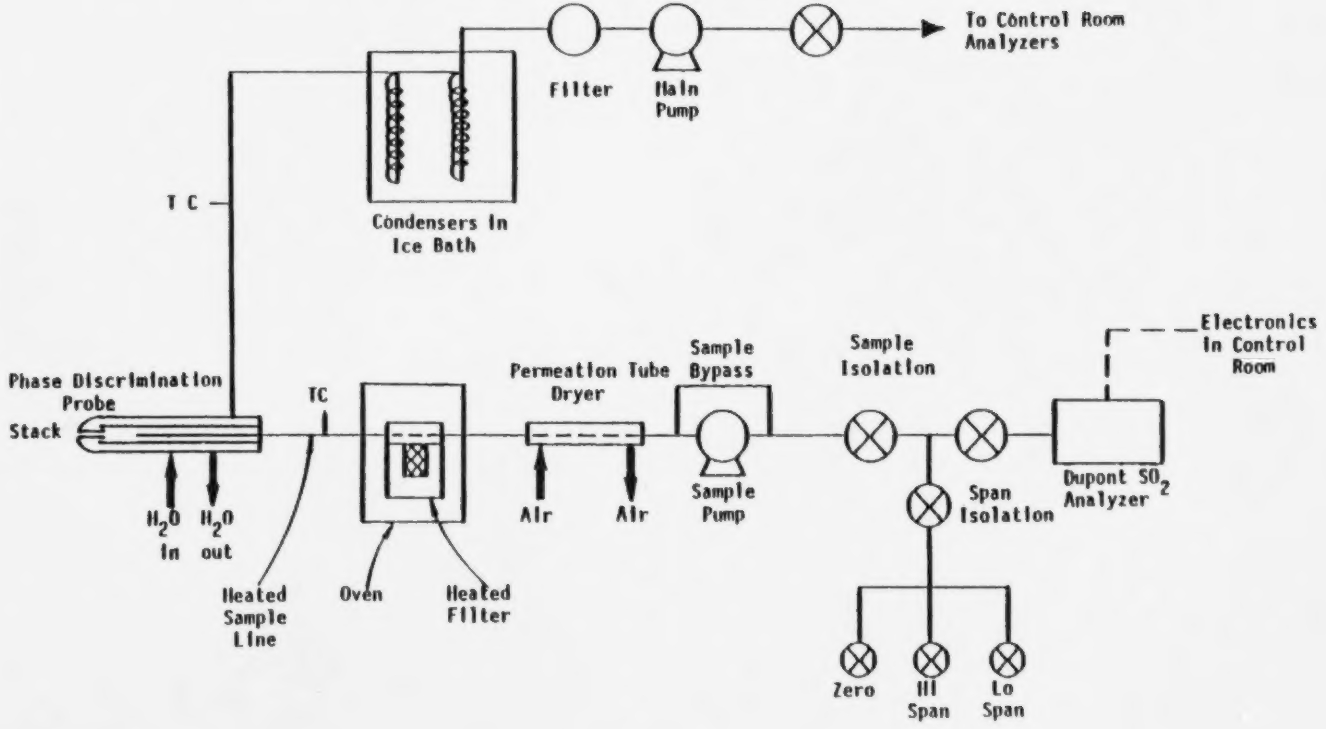

To Control Room
Analyzers
Filter
Main
Pump
T C
Condensers In
Ice Bath
Phase Discrimination
Probe
Stack
H_2O
In
H_2O
out
Heated
Sample
Line
TC
Oven
Heated
Filter
Permeation Tube
Dryer
Air
Air
Sample
Bypass
Sample
Pump
Sample
Isolation
Span
Isolation
Zero
Hi
Span
Lo
Span
Dupont SO_2
Analyzer
Electronics
In Control
Room

Figure 2-10. Schematic for LWS Sampling System.

SECTION 3

BURNER PERFORMANCE AND NO_x EMISSIONS

Five RSC burners were evaluated in two separate test series. Burner performance was evaluated in terms of the following criteria:

- NO_x emissions
- Combustion efficiency
- Flame stability
- Flame length and shape
- Operating range

The first series of tests optimized the performance of the RSC DMB using its adjustable parameters. The two commercial RSC burner designs, the Flare and CCV, were evaluated in a second series of tests. Both the Flare and CCV burners have been well characterized in both research test facilities and operating boilers. Characterizing their performance in the LWS establishes a basis for evaluating the prototype DMB and extrapolating its performance to an operating boiler, for example CILCO Duck Creek Unit 1.

3.1 COMMERCIAL RSC BURNER PERFORMANCE IN THE LWS

The two RSC commercial burner designs, the Flare and CCV burners, were tested at two burner scales 50 x 10^6 and 100 x 10^6 Btu/hr The tests of these burners thus provides for evaluating burner performance and "calibration" of measured LWS burner performance to an operating boiler.

3.1.1 RSC Flare Burner Performance

The performance of the 100 x 10^6 Btu/hr Flare burner in the LWS was characterized for the Utah and Illinois coals. All the tests were conducted unstaged and with the coal impeller flush with the coal nozzle exit. This impeller position was the baseline, or zero, position.

A brief series of tests to evaluate the effect of register position on burner performance were conducted while firing Utah coal. The results are summarized in Figure 3-1. At register vane positions less than 47 degrees open, the high swirl generated resulted in a very strong recirculation zone at the base of the flame. This recirculation created an extremely wide flame which spread along the front wall. CO emissions increased slightly for conditions that produced such wall flames. Flame impingement on the wall may have resulted in locally reduced temperatures and quenching of combustion.

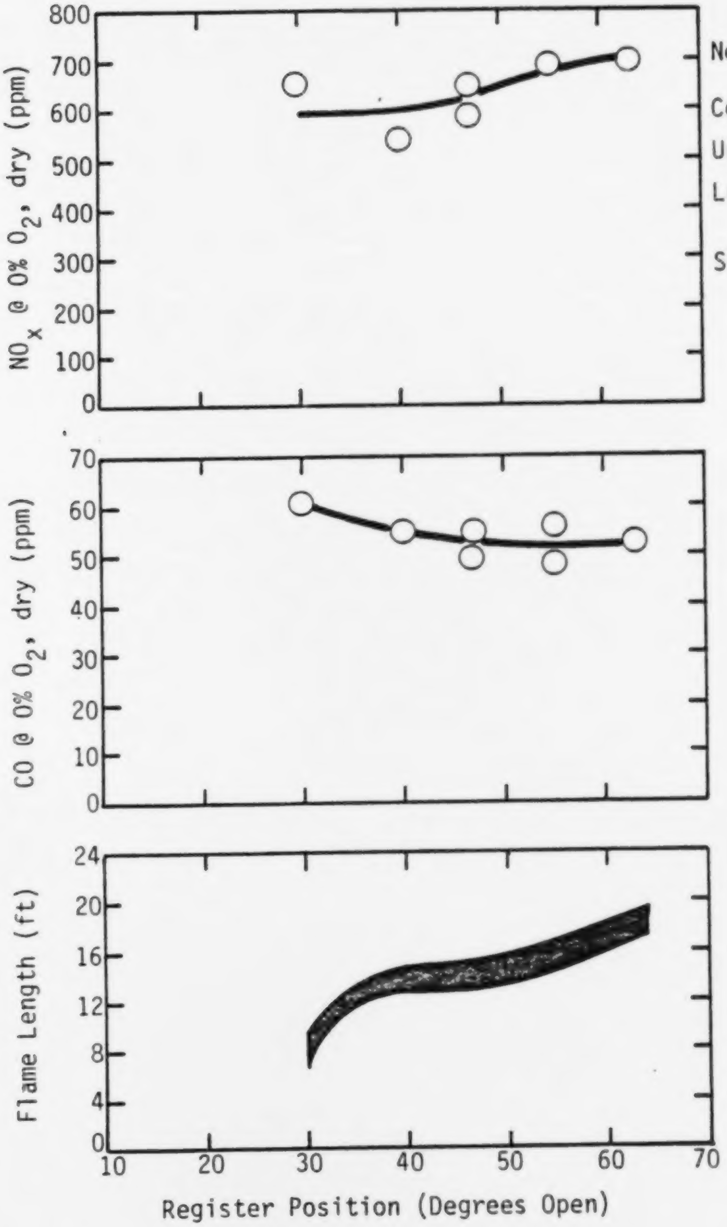
A register setting between 50 and 55 degrees open resulted in a short, intense flame 14 to 16 feet long. The flame was observed to be very stable, characteristic of Flare burners in field installations. For register vane positions more than 55 degrees open, the flame length increased to 19 feet, the base of the flame lifted off the burner exit and NO_x emissions increased slightly. The Illinois coal required a slightly more closed position, about 47 degrees open, to produce flame characteristics similar to the Utah coal at 50 to 55 degrees open.

The effect of excess air on emissions from the 100 x 10^6 Btu/hr Flare burner is summarized in Figure 3-2. For Utah coal, NO_x emissions were reduced by 14 ppm/percent theoretical air (TA). At the design point overall stoichiometry (SR_T) of 120 percent TA, NO_x emissions were 690 ppm. The CO emissions remained constant at about 45 ppm down to an excess air level of 10 percent. Below this "knee," CO emissions increased to almost 70 ppm indicating reduced combustion efficiency. The trend for the Illinois coal was similar with NO_x reduced by 13 ppm/percent TA. Emissions at the design point were 678 ppm for the Illinois, about two percent lower than for the Utah coal. For the Illinois coal, the CO "knee" occurred at about 13 percent excess air.

Another indication of combustion efficiency is the carbon content of the fly ash. At nominal design conditions, SR_T equal to 120 percent TA, carbon in the ash was 5.5 and 3.8 percent, dry, for the Utah and Illinois coals, respectively.

A single test was conducted with the 100 x 10^6 Btu/hr Flare to evaluate the effect of firing rate and thermal environment on emissions and performance. Reducing the firing rate to 79 x 10^6 Btu/hr resulted in a 15 percent reduction in NO_x down to 579 ppm with no change in CO, as shown in Figure 3-2. Reducing the load below 75 x 10^6 Btu/hr resulted in an unstable flame that could not be maintained regardless of burner adjustments.

A brief series of tests were conducted with the 50 x 10^6 Btu/hr Flare burner firing the Utah coal. Testing of the burner was limited because of problems experienced in maintaining stable operating conditions. The coal spreader from this reduced scale Flare burner



Nominal Conditions:

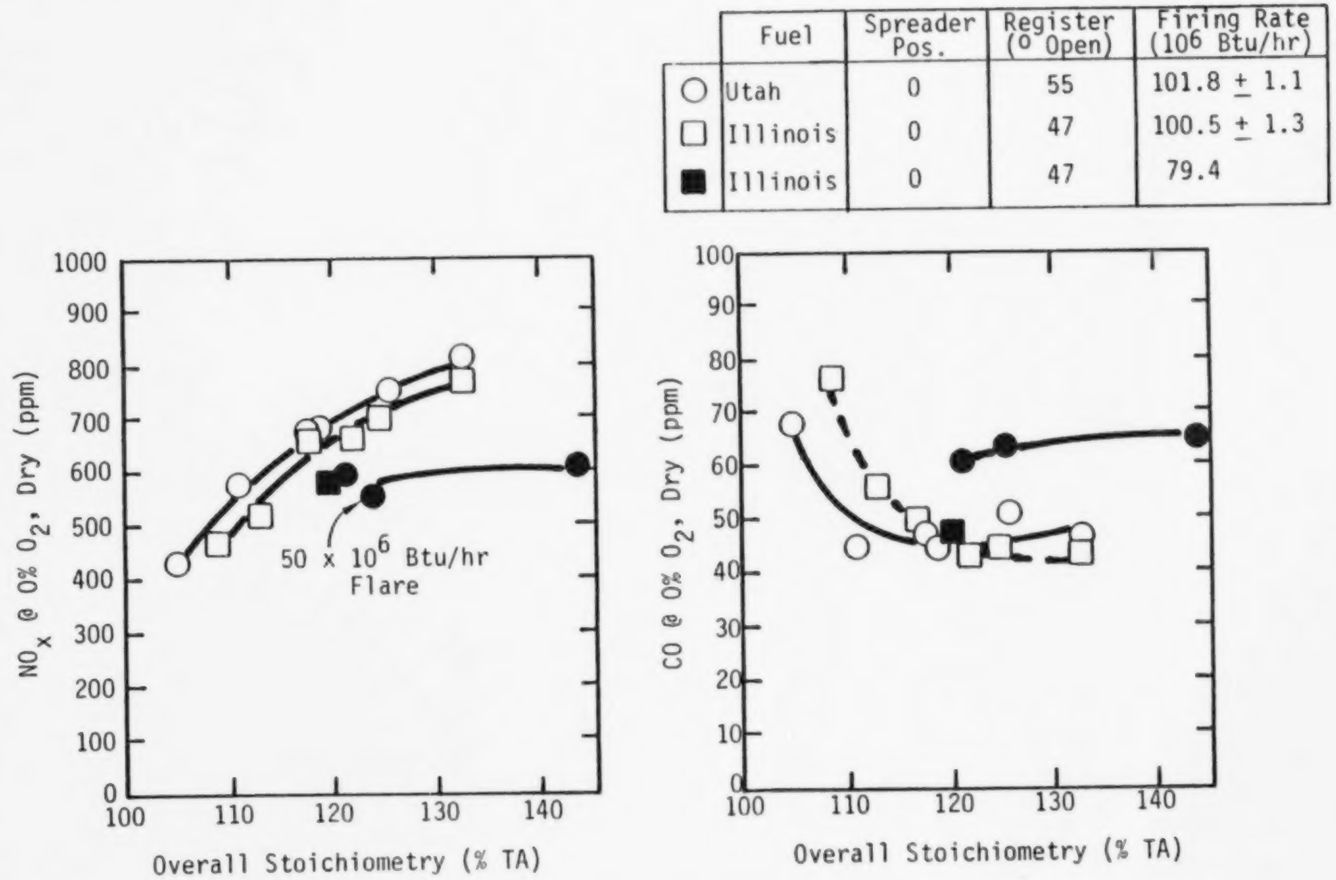
Coal--Utah

Unstaged Operation

Load = 101.5 ± 1.4 x 10^6 Btu/hr

SR_T = 120 ± 1.25 % TA

Figure 3-1. Effect of Secondary Air Swirl on 100 x 10^6 Btu/hr Flare Burner Performance



	Fuel	Spreader Pos.	Register (° Open)	Firing Rate (10^6 Btu/hr)
○	Utah	0	55	101.8 ± 1.1
□	Illinois	0	47	100.5 ± 1.3
■	Illinois	0	47	79.4

Figure 3-2. Effect of Excess Air on 100 x 10^6 RSC Flare Burner Unstaged Performance

produced coal head pressures between 10 and 12 inches H_2O which restricted air flow through the pulverizer/primary air system. This resulted in insufficient air flow to transport the coal through the pulverizer to maintain steady 50 x 10^6 Btu/hr coal throughput. In addition, the large volume of the LWS and the resulting cold thermal environment probably magnified the difficulties with maintaining steady operating conditions.

The flame that was achieved with the 50 x 10^6 Btu/hr Flare burner was relatively dull and lacked the intensity observed for the larger Flare burner. Included in Figure 3-2 are the limited data obtained with this burner. NO_x emissions at the load achieved, 42 x 10^6 Btu/hr, were about 17 percent lower than for the 100 x 10^6 Btu/hr flare. The furnace exit temperature was measured to be about 1130°F, or about 27 percent less than at 100 x 10^6 Btu/hr. This cold environment also resulted in a 25 ppm increase in CO emissions.

3.1.2 RSC CCV Burner Performance

The CCV burner is currently installed at CILCO Duck Creek Unit 1 and has well-defined characteristics. Tests were conducted on two CCV burners with design firing capacities of 50 x 10^6 and 100 x 10^6 Btu/hr to provide a direct correlation between the LWS test furnace and a field unit. In addition to the normal adjustable burner parameters of spreader position and register vane angle, three different spreader designs were also evaluated.

1) Baseline CCV Cone, (BL Cone)

2) RSC DMB Spreader, #5

3) Long-Bladed Spreader, #5L

These designs are described in Section 3.2.

The 100 x 10^6 Btu/hr version of the CCV was tested first over a range of burner adjustments. The effect of spreader position on burner performance for two spreader designs, the BL cone and spreader #5L, are shown in Figure 3-3. For the BL cone spreader, retracting the spreader from 0 to 12 inches increased NO_x by about 45 ppm. By retracting this spreader, the degree of swirl generated increases providing for better coal and air mixing. At either extreme position tested, 0 or -12 inches from baseline, the flame length increased to 22 feet resulting in impingement of the flame on the rear wall. This is unacceptable for continued operation for the LWS facility. The optimum spreader position for acceptable flame characteristics and emission was 6 inches retracted from the baseline position.

Nominal Conditions:

Unstaged Operation

Utah Coal

Firing Rate = 99.6 ± 1.6 x 10^6 Btu/hr

SR_T = 121.0 ± 0.9% TA

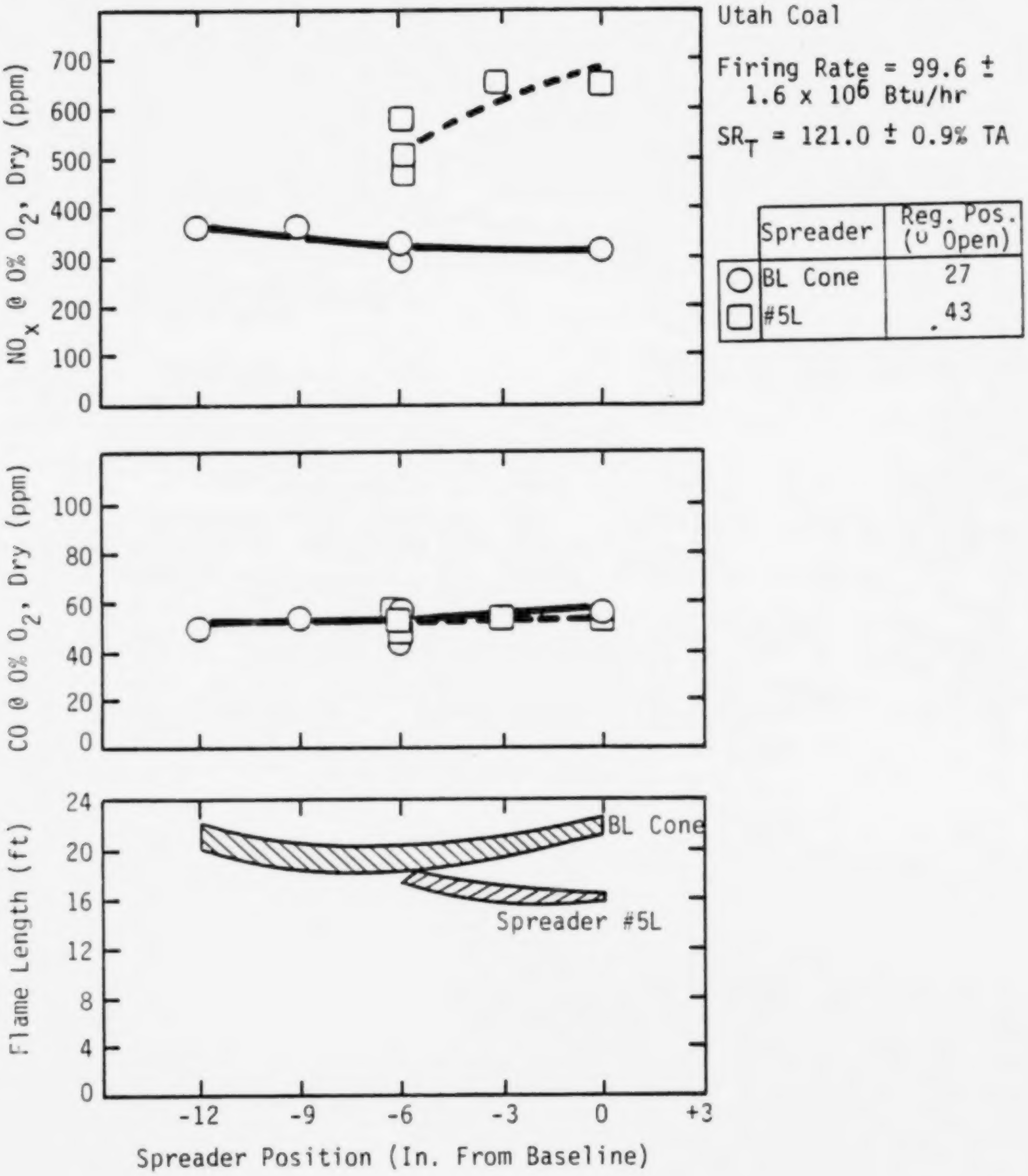


Figure 3-3. Effect of Spreader Position on 100 x 10^6 Btu/hr CCV Burner Performance at Unstaged Conditions

Retraction of spreader #5L from 0 to 6 inches decreased NO_x by about 100 ppm without a measurable change in CO. Flame length was acceptable for the LWS firing depth at about 18 feet for this retracted spreader position. At the zero spreader position, flame length decreased slightly and flame standoff from the exit increased from 0 to 6-12 inches. Both a shorter flame and a lifted flame generally result in higher NO_x emissions. Thus, a position of -6 inches was also determined to be best for spreader #5L.

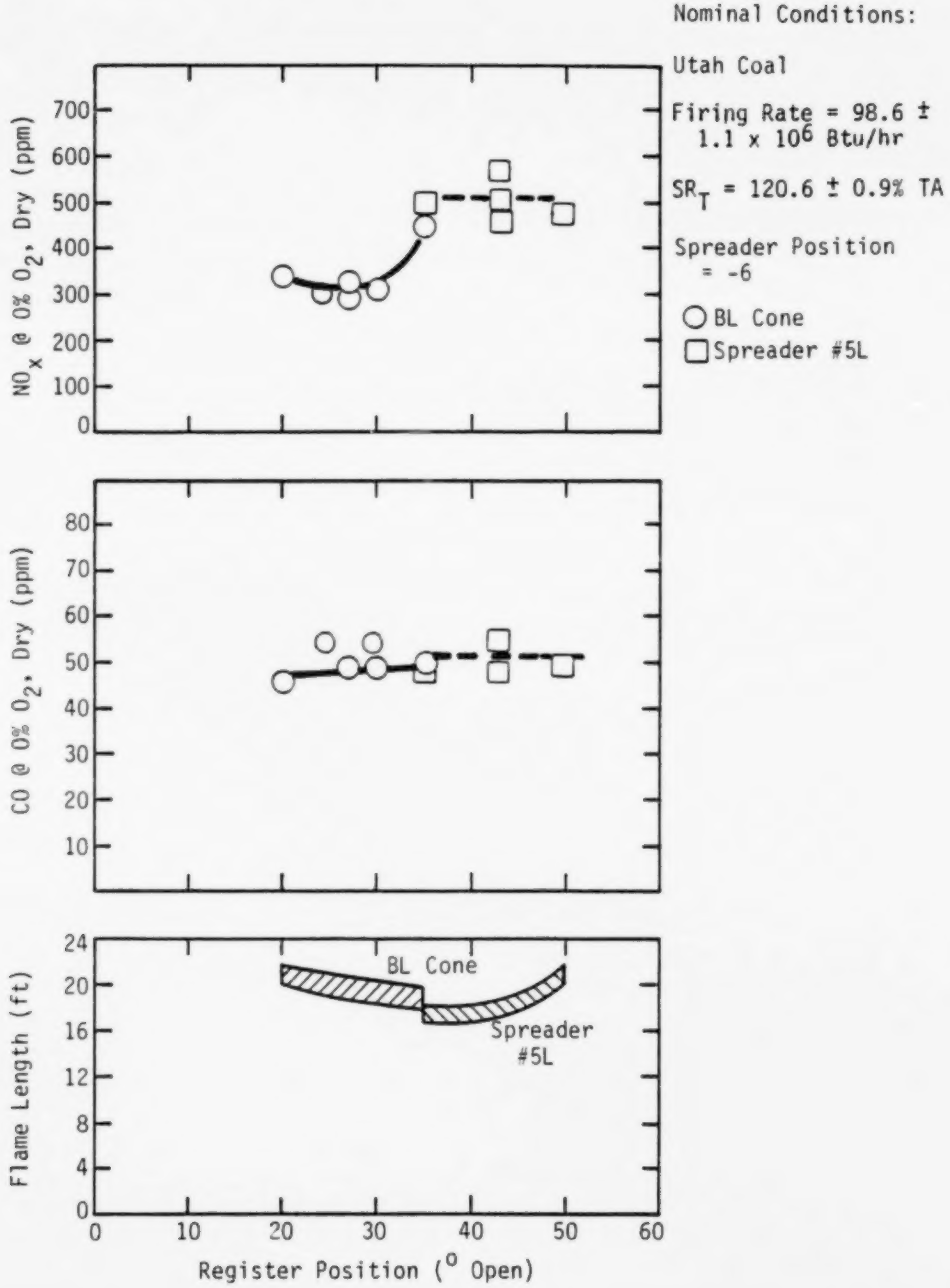
The effect of secondary swirl on the unstaged performance of the 100 x 10^6 Btu/hr CCV burner is summarized in Figure 3-4. With the BL cone, a register position of 35 degrees open resulted in NO_x emissions of 450 ppm. The flame was over 16 feet wide with pulsations of smoke and flame out LWS side observation ports. Closing the register vane angle to 20 degrees open resulted in a flame exceeding the firing depth of the LWS, 22 feet. The optimum register position with the BL cone spreader configuration was 30° open. The result was a stable flame 18-20 feet long, with NO_x emissions of about 330 ppm.

Register position had little effect on emissions with spreader #5L. At a register vane angle of 50 degrees open, the flame length increased to 22 feet. The register position selected as optimum with spreader #5L was 43 degrees open, which produced a stable flame about 18 feet long with NO_x emissions of 460 ppm.

The effect of spreader design on unstaged burner performance was evaluated with Utah coal. The optimum condition for each spreader was utilized for these tests. Figure 3-5 summarizes the results. The BL cone had the lowest NO_x emissions with 322 ppm at the design point (SR_T equal to 120 percent TA). NO_x decreased 9 ppm/percent TA with CO emissions constant at about 53 ppm down to an excess air level of 13 percent. The flame was approximately 20-22 feet in length with excellent stability at nominal conditions. At low excess air levels, less than 12 percent excess air, the flame length increased to over 22 feet.

Also included in Figure 3-5 are emission characteristics for the CCV burner with spreader #5 and #5L. Emissions with spreader #5 were 644 ppm at 20 percent excess air. NO_x decreased at a rate of about 16 ppm for each percent decrease in excess air. CO levels remained constant over the range of excess air tested. The longer-bladed spreader #5L yielded 479 ppm NO_x, a 165 ppm reduction compared to spreader #5. The effect of excess air was similar to the other two spreaders with a rate of decrease of 14 ppm NO_x/percent excess air. CO levels were measured to be about 10 ppm higher for spreader #5L than with #5.

Flame length increased to about 18 feet with spreader #5L, compared to 14-16 feet for spreader #5. The baseline cone spreader produced significantly longer flames, 20 to 22 feet in length, with



Nominal Conditions:

Utah Coal

Firing Rate = 98.6 ± 1.1 x 10^6 Btu/hr

SR_T = 120.6 ± 0.9% TA

Spreader Position = -6

Figure 3-4. Effect of Register Position on CCV Performance at Unstaged Conditions

Nominal Conditions:
Fuel--Utah
Firing Rate = 99.7 ± 2.4 x 10^6 Btu/hr

	Spreader	Position	Register (^{o} Open)
◇	BL Cone	-6	30
○	#5	0	47
■	#5L	-6	43

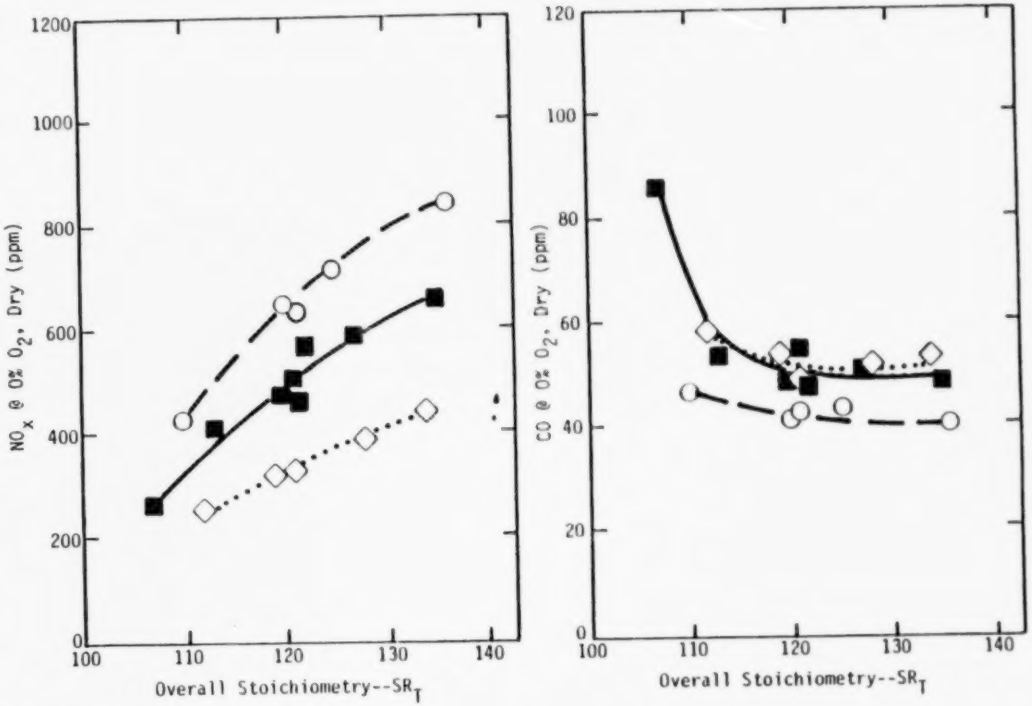


Figure 3-5. Effect of Spreader Design of 100 x 10^6 Btu/hr CCV Unstaged Performance

corresponding lower NO_x emissions. The spreader achieving the lowest NO_x emissions, the BL cone, also resulted in lower combustion efficiency as indicated by fly ash carbon content, 13.85-14.83 percent dry. Carbon content for spreader. #5 and #5L were lower, 3.88 and 6.88, respectively.

The spreader design was the critical parameter in determining CCV burner performance. NO_x emissions were reduced 50 percent by modifying the spreader design. Even a relatively small change in blade length resulted in a 26 percent decrease in NO_x emissions. The conical spreader, which yielded the lowest emissions in the LWS tests, is the design utilized in the CCV burners installed at the CILCO Duck Creek boiler. This configuration was tested with Illinois coal to more fully characterize burner performance as well as to provide data to link the LWS test results to an operating boiler.

Emissions for Utah and Illinois coal from the baseline configuration of the 100 x 10^6 Btu/hr CCV burner are compared in Figure 3-6. NO_x emissions from the Illinois coal were about 80 ppm higher than for the Utah over the entire excess air range, with the general trends for the two coals comparable. CO levels were also comparable for the range tested. Combustion efficiency, as indicated by carbon content in the fly ash improved for the Illinois coal with values ranging from 3.01 to 4.33 percent carbon.

Although the baseline cone resulted in the lowest emissions compared to the other spreader configurations, resultant flame lengths were too long, 20 feet, at unstaged conditions to proceed with staging. Diverting air to the tertiary ports generally increases flame length by about 4-6 feet which would result in a flame exceeding the firing depth of the LWS. Spreader #5L produced a relatively short flame under unstaged operation and thus was evaluated for NO_x reduction potential with staged combustion.

Results from staging this CCV burner configuration are shown in Figure 3-7. Stable operation could be maintained down to a burner zone stoichiometry of 70 percent TA, with NO_x emissions reduced by 40 percent to a level of 288 ppm. Flame length increased to 20-21 feet as the degree of staging was increased. Combustion efficiency did not decrease significantly as indicated by a negligible increase in CO emissions and as fly ash carbon, 8.13 percent dry.

The effect of excess air on staged burner performance is summarized in Figure 3-8. NO_x emissions were much less sensitive to excess air levels during staged combustion than during unstaged operation, with a rate of change of only about 6 ppm/percent TA compared to about 14 ppm/percent TA. The range of excess air for efficient combustion was more limited, with CO increasing rapidly below 17 percent excess air. Staged operation of this configuration

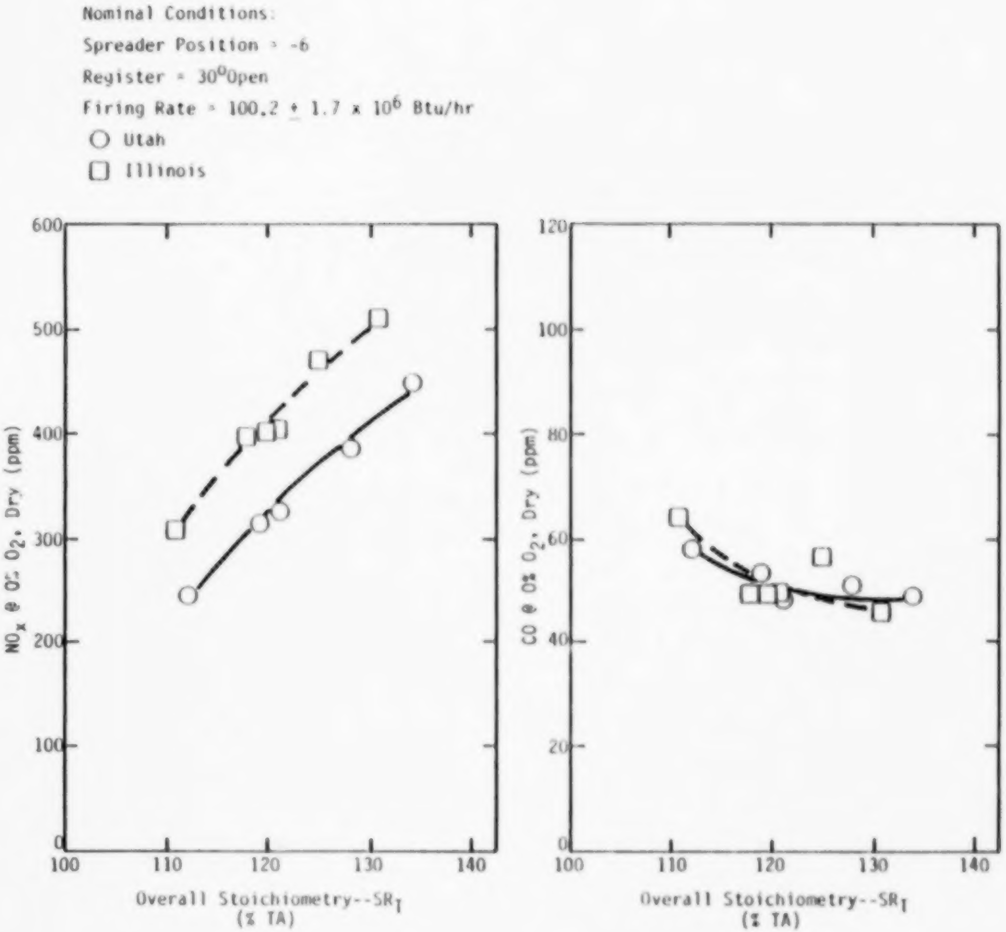


Figure 3-6. Unstaged Performance of the 100 x 10^6 Btu/hr CCV Burner with Conical Spreader

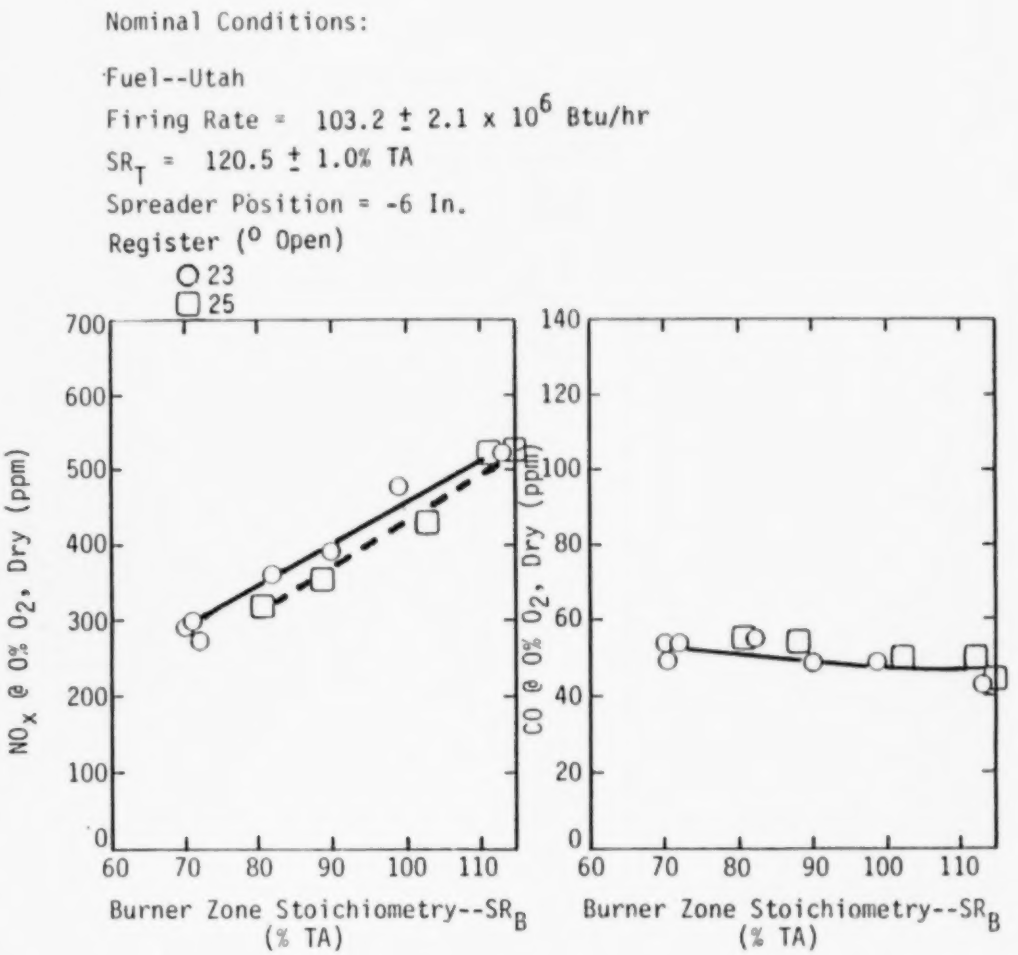


Figure 3-7. Effect of Staging on the Emissions from the 100 x 10^6 Btu/hr CCV Burner Equipped with Spreader #5L

Nominal Conditions:

Fuel -- Utah Coal

Firing Rate = 104.3 ± 3.1 x 10^6 Btu/hr

SR_B = 70 ± 3.2% TA

Spreader Position = -6 In.

Register = 23^0 Open

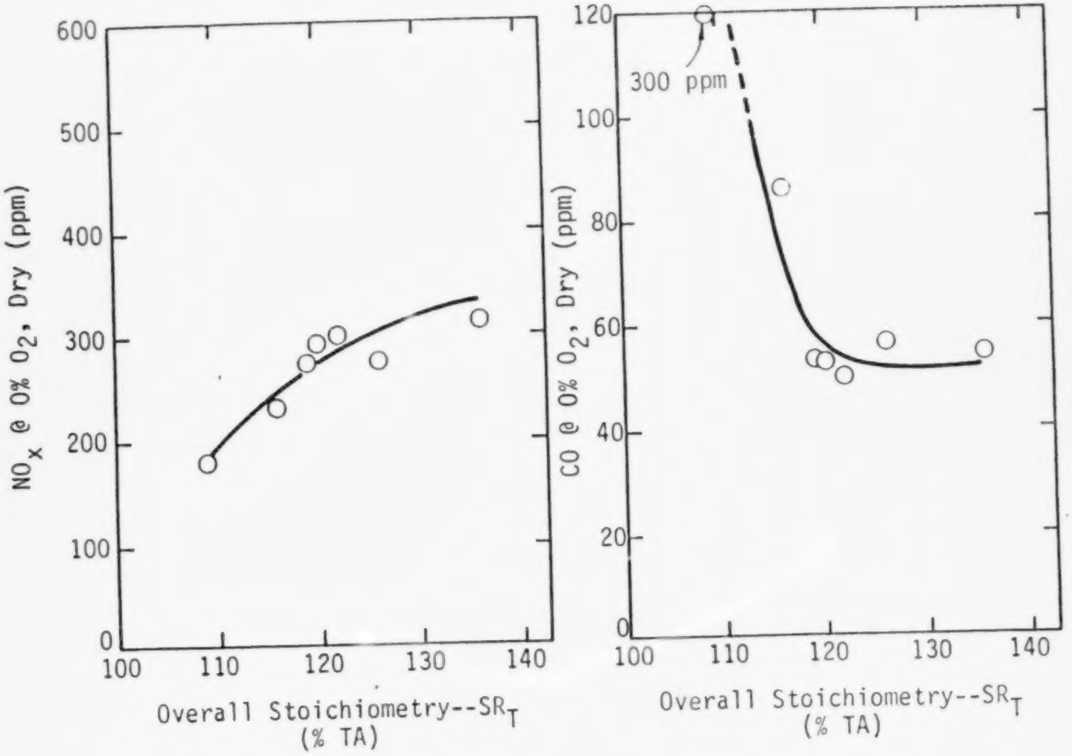


Figure 3-8. Effect of Excess Air on Staged Operation of the 100x10^6 Btu/hr CCV Burner Equipped with Spreader #5L

reduces the operating range compared to normal unstaged conditions. However, staging within this somewhat more restricted range can reduce NO_x emissions by 40 percent without sacrificing efficiency.

The 100 x 10^6 Btu/hr CCV burner was tested over a range of firing rates to define the typical turndown range for RSC commercial burner designs in the LWS. The results are summarized in Figure 3-9 for two spreader designs, the baseline cone and #5L. To maintain flame stability at reduced loads, it was necessary to close the secondary air register to 20 degrees open for the BL cone spreader.

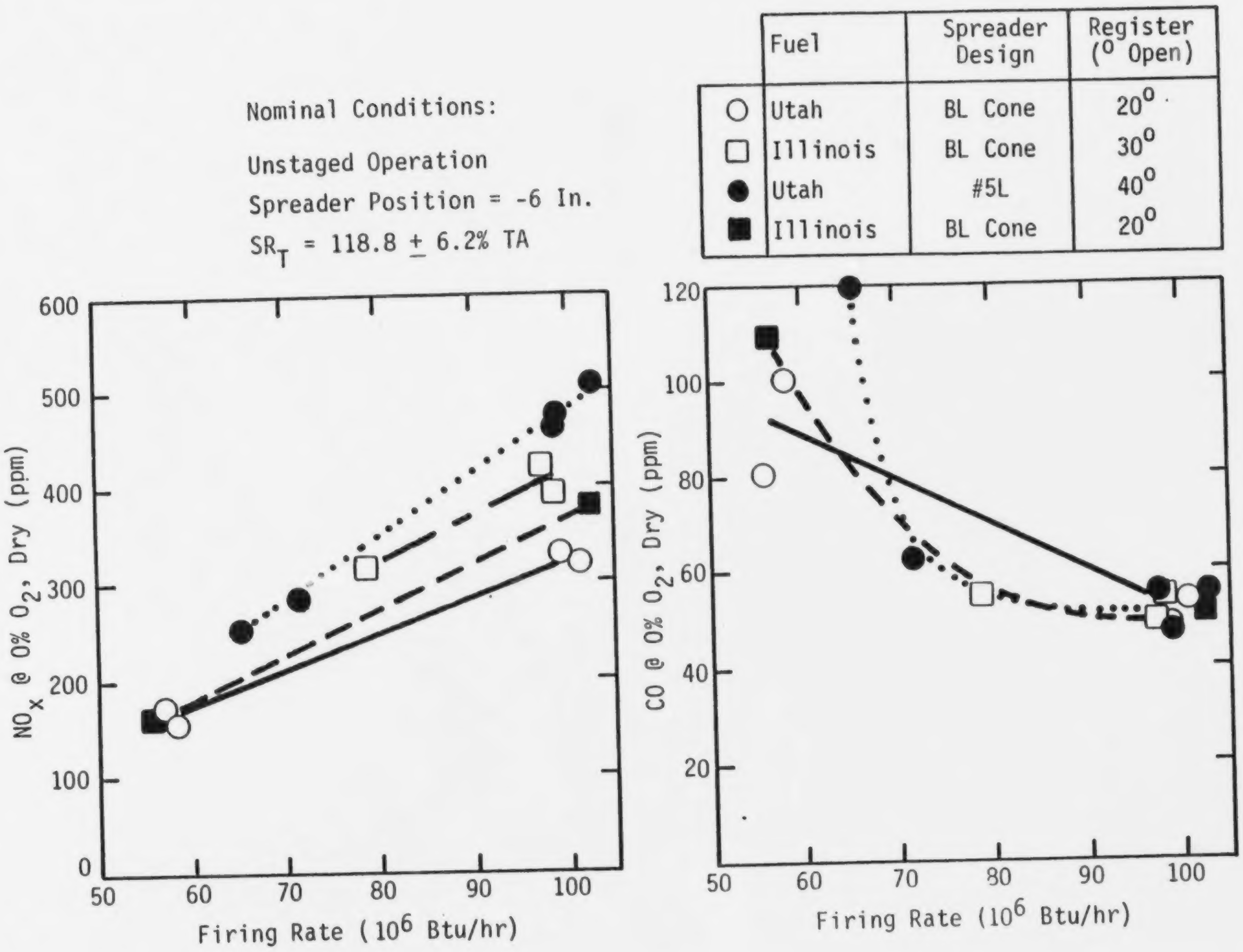
The commercial design, the BL cone, had the greatest turndown range, 1.75:1. The flames at reduced firing rates were less intense, but remained stable with flame lengths reduced to 12-14 feet. NO_x emissions from the Utah coal were reduced by 52 percent at a rate of 4 ppm/10^6 Btu/hr to 154 ppm at a firing rate of 58.5 x 10^6 Btu/hr. CO levels, however, increased as load was decreased.

Firing rate had a greater effect on NO_x emissions with the Illinois coal, 61 percent reduction to 156 ppm at 56 x 10^6 Btu/hr. As with the Utah coal, CO emissions for the Illinois coal increased as firing rate was reduced. The decrease in combustion efficiency as indicated by an increase in CO emissions is in part due the thermal environment of the LWS. Furnace exit temperatures decreased almost 250°F at 60 percent load.

For the other spreader design considered, #5L, turndown was limited to about 70 x 10^6 Btu/hr. NO_x emissions were reduced by 42 percent at 71 x 10^6 Btu/hr. Below this firing rate, flame stability and burnout problems were encountered.

A limited test series was conducted using the scaled-down CCV burner with a rated firing capacity of 50 x 10^6 Btu/hr. Scaled-down versions of the baseline cone and spreader #5L were used in order to compare the effects of design firing rates on burner performance. Initial tests with Utah coal and spreader #5L resulted in the inability to maintain a coal flame without oil support. This was probably due to the large volume of the LWS and resulting "cold" thermal environment preventing the establishment of conditions for acceptable combustion regardless of burner settings.

A subsequent test was conducted using the CCV-BL cone configuration with Illinois coal. The burner was initially overfired to about 60 x 10^6 Btu/hr. Then firing rate was slowly decreased to a load of 50 x 10^6 Btu/hr, which enabled maintaining a stable flame. The resulting flame was the characteristic "low-NO_x flame" obtained in previous MT tests with the CCV. Figure 3-10 illustrates this tubular-shaped flame, about 10 feet in length. The flame is characterized between a tubular, narrow shape at the burner exit, with the width slightly flaring at the end of the flame.



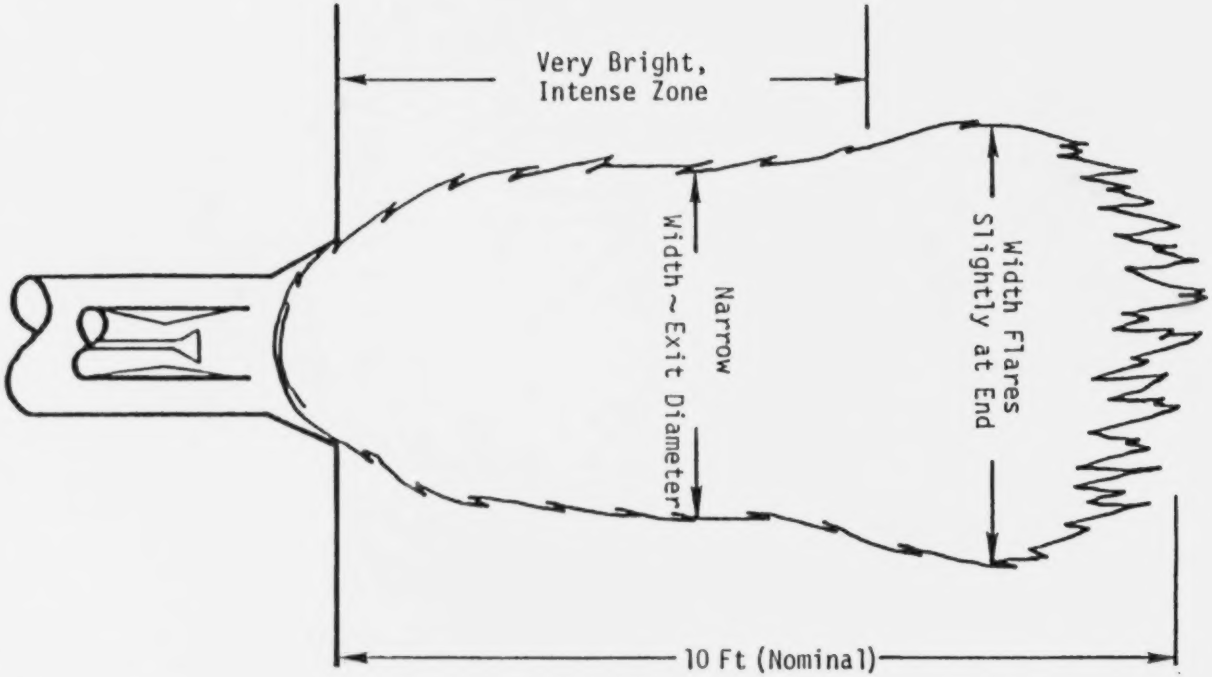
Nominal Conditions:

Unstaged Operation

Spreader Position = -6 In.

SR_T = 118.8 ± 6.2% TA

Figure 3-9. Turndown Range of 100 x 10^6 Btu/hr CCV Burner Under Unstaged Conditions



Very Bright,
Intense Zone
Narrow
Width ~ Exit Diameter
Width Flares
Slightly at End
10 Ft (Nominal)

Figure 3-10. Typical "Low-NO_x" Flame Shape with the 50 x 10^6 Btu/hr CCV Burner

Figure 3-11 summarizes the unstaged performance of the 50 x 10 Btu/hr CCV with Illinois coal. At the design point of 20 percent excess air, NO_x emissions were about 370 ppm with CO emissions of 80 ppm. An increase in excess air did not increase NO_x emissions while CO emissions increased about 10 ppm. Reduction of excess air to 14 percent decreased NO_x by 25 percent with no significant change in CO emissions.

The performance of the 100 x 10^6 Btu/hr CCV burner at two nominal firing rates, 100 and 56 x 10^6 Btu/hr are also shown in Figure 3-11 to allow a direct comparison with the 50 x 10^6 Btu/hr CCV burner. NO_x emissions were about 20 ppm higher at the design point, SR_T equal to 120% TA, for the 100 x 10^6 Btu/hr CCV burner compared to the 50 x 10^6 Btu/hr CCV burner. However, the CO emissions were about 30 ppm higher with the 50 x 10^6 Btu/hr CCV. As excess air was increased, the 50 x 10^6 Btu/hr CCV burner NO_x emissions were about 17 percent lower than for the larger burner. The increase in CO emissions as a result of increased excess air was probably due to a "quenching" effect with the addition of more combustion air which further reduced furnace temperatures.

At reduced load, the 100 x 10^6 Btu/hr CCV produced approximately 61 percent lower NO_x than the 50 x 10^6 Btu/hr CCV with significantly higher CO, 25 ppm. Carbon in the ash for the two burners at comparable firing rates were similar with 5.34 and 5.44 percent, dry, for the 50 x 10^6 Btu/hr CCV and 100 x 10^6 Btu/hr CCV, respectively. The larger CCV burner at full load had a lower carbon in the ash of 4.33 percent dry, indicating decreased efficiency at the lower loads. The furnace exit temperatures for the two low load conditions were similar, 1250°F. The 50 x 10^6 Btu/hr CCV burner has velocities through the burner passages identical to the 100 x 10^6 Btu/hr CCV. The similarity in NO_x emissions for the 50 x 10^6 Btu/hr CCV burner and 100 x 10^6 Btu/hr burner at design point operation indicates that the aerodynamics of the burner in addition to thermal effects should be considered in determining scaling factors for specific burners.

3.2 RSC DISTRIBUTED MIXING BURNER

The design of the RSC DMB incorporated a number of variables to permit flexibility in achieving optimum performance. The adjustable components included:

- Retractable coal spreader
- Center body coal spreader design
- Telescoping RSC venturi coal nozzle
- Two parallel secondary air registers for swirl control

Nominal Conditions:
Fuel--Illinois
Firing Rate = 50.1 ± 1.5 x 10^6 Btu/hr
Spreader Position = -6 In.
Register = 20^0 Open

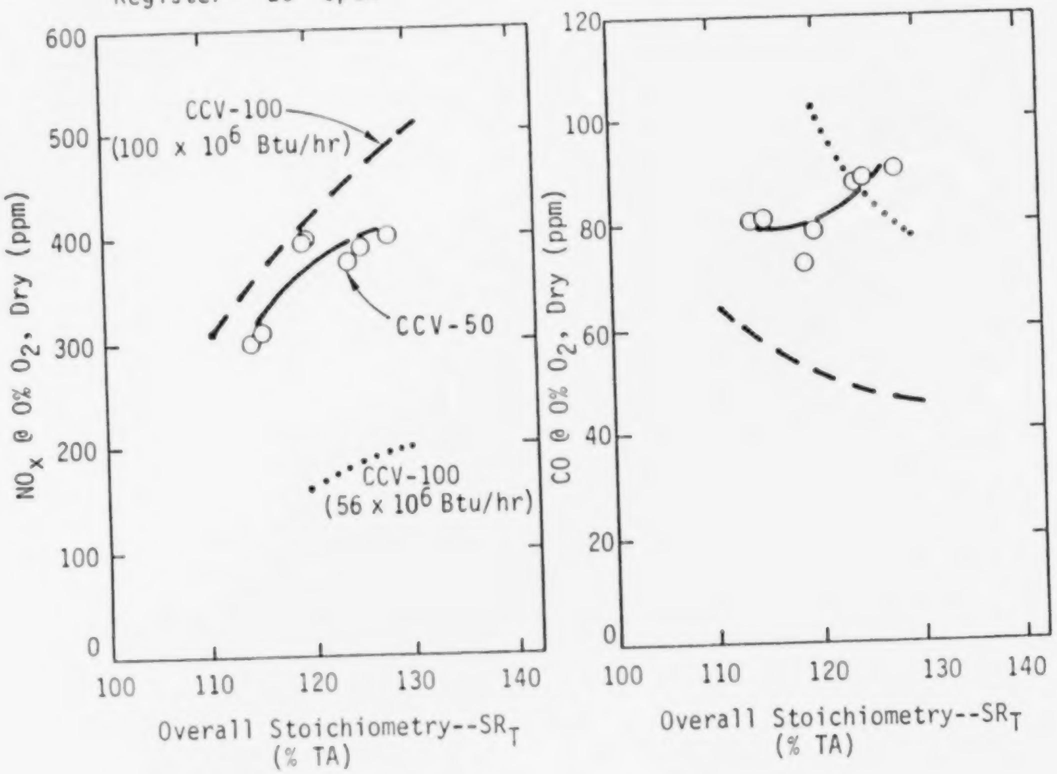


Figure 3-11. Summary of 50 x 10^6 Btu/hr CCV Burner Equipped with Conical Spreader

- Removable inserts for tertiary air velocity variation

A comprehensive series of parametric tests were conducted to optimize the performance of the DMB.

3.2.1 Initial Optimization with Utah Coal

The RSC DMB was first equipped with the venturi coal nozzle and BL cone spreader configuration developed as part of the RSC CCV burner. Figure 3-12 summarizes the unstaged performance with this spreader. NO_x emissions were low, 236 ppm, with 60 ppm CO at 20 percent excess air. The flame producing these low emissions was long, impinging on the rear wall 22 feet from the burner exit. Fly ash collected during these unstaged tests contained over 17 percent carbon, an indication of poor performance. The low-NO_x emissions and high carbon in the ash indicate that the long flame, impinging on the relatively cold rear wall of the LWS, was in effect quenched. The burner variables, such as spreader position, did not significantly affect performance. The range of register positions for stable performance was observed to be narrow.

Figure 3-13 illustrates the effect of register position on unstaged performance, especially flame characteristics. The ignition point of the flame lifted from the burner exit with register positions more than 30° open. When the registers were opened to 35°, the base of the flame was observed to lift off the exit from its normal stable operating point, rooted well into the burner exit, to an estimated 7 feet from the firing face.

The long flame produced from the First spreader configuration was unacceptable for testing in the LWS. A second spreader design, with 4 blades set at a 15° angle from axial on a 4-inch pipe, was selected to increase the velocity of the primary air and coal through the venturi nozzle, and thus increase the mixing induced by the spreader vanes. The increased swirl of the primary air and coal did improve mixing and produced a significantly shorter unstaged flame. Flame length was reduced from over 22 feet long to only 12-14 feet. NO_x emissions under unstaged conditions increased to 280-315 ppm. Carbon content of fly ash samples was about 5.9 percent, much lower than achieved with the BL cone spreader.

Diversion of combustion air to the 12-inch diameter tertiary air ports produced the staged performance summarized in Figure 3-14. Initial staging was done with the registers at 25° open. However, it was necessary to close both registers to 20° open to maintain stability at burner zone stoichiometries less than 90 percent TA. NO_x was reduced from about 338 ppm unstaged to 144 ppm at a burner zone stoichiometry of 72 percent. CO, an indication of combustion efficiency, gradually increased from 35 ppm unstaged to over 70 ppm. Analysis of fly ash at the staged condition yielded about 22 percent

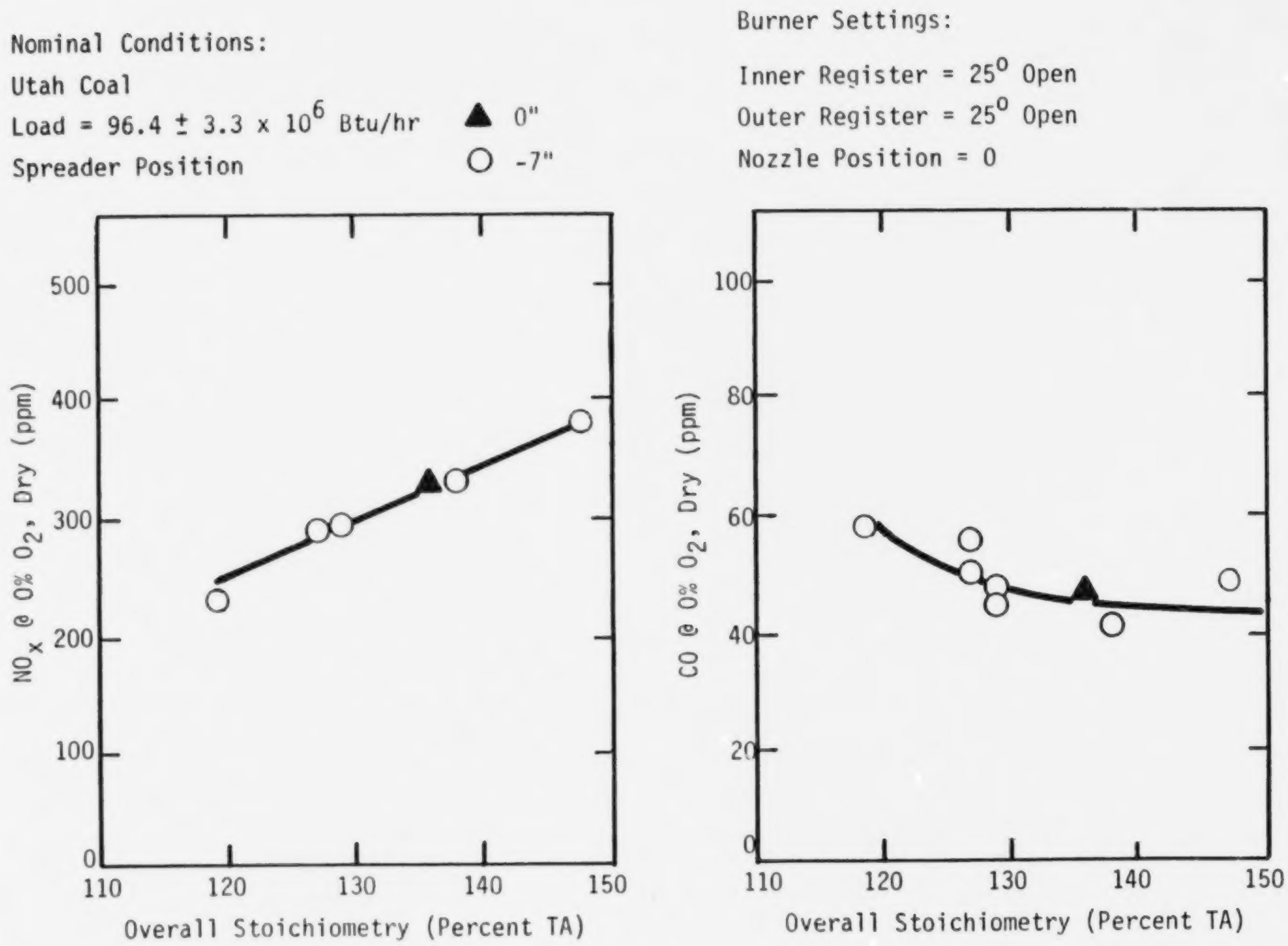
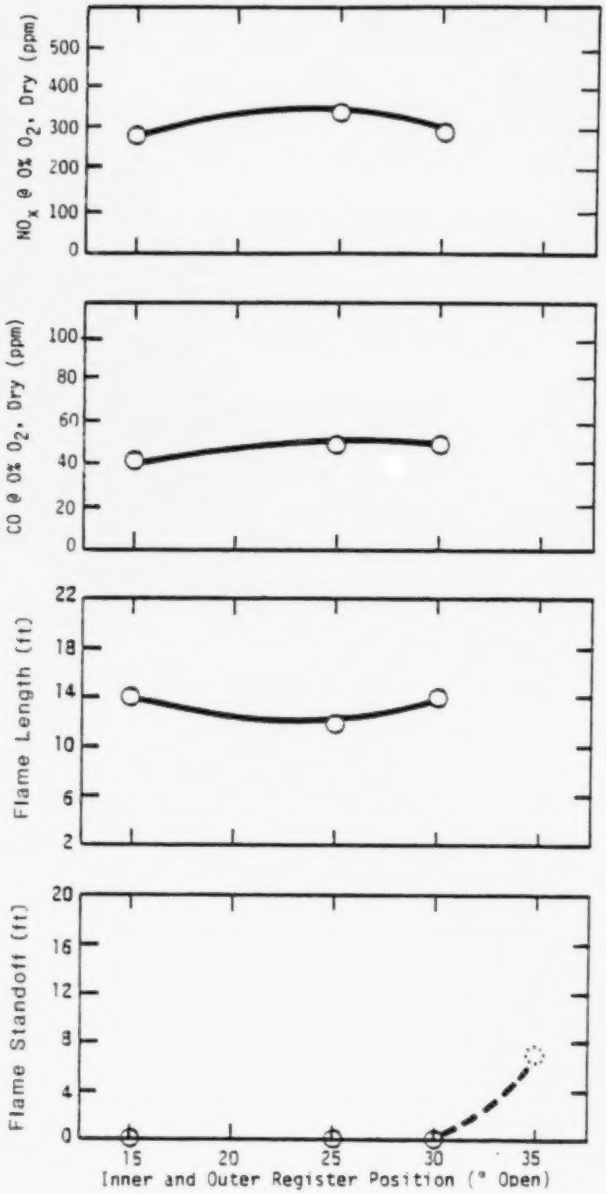


Figure 3-12. RSC DMB Unstaged Performance with CCV Spreader



Nominal Conditions:

Utah Coal

Load = $98.4 + 1.7 \times 10^6$ Btu/hr

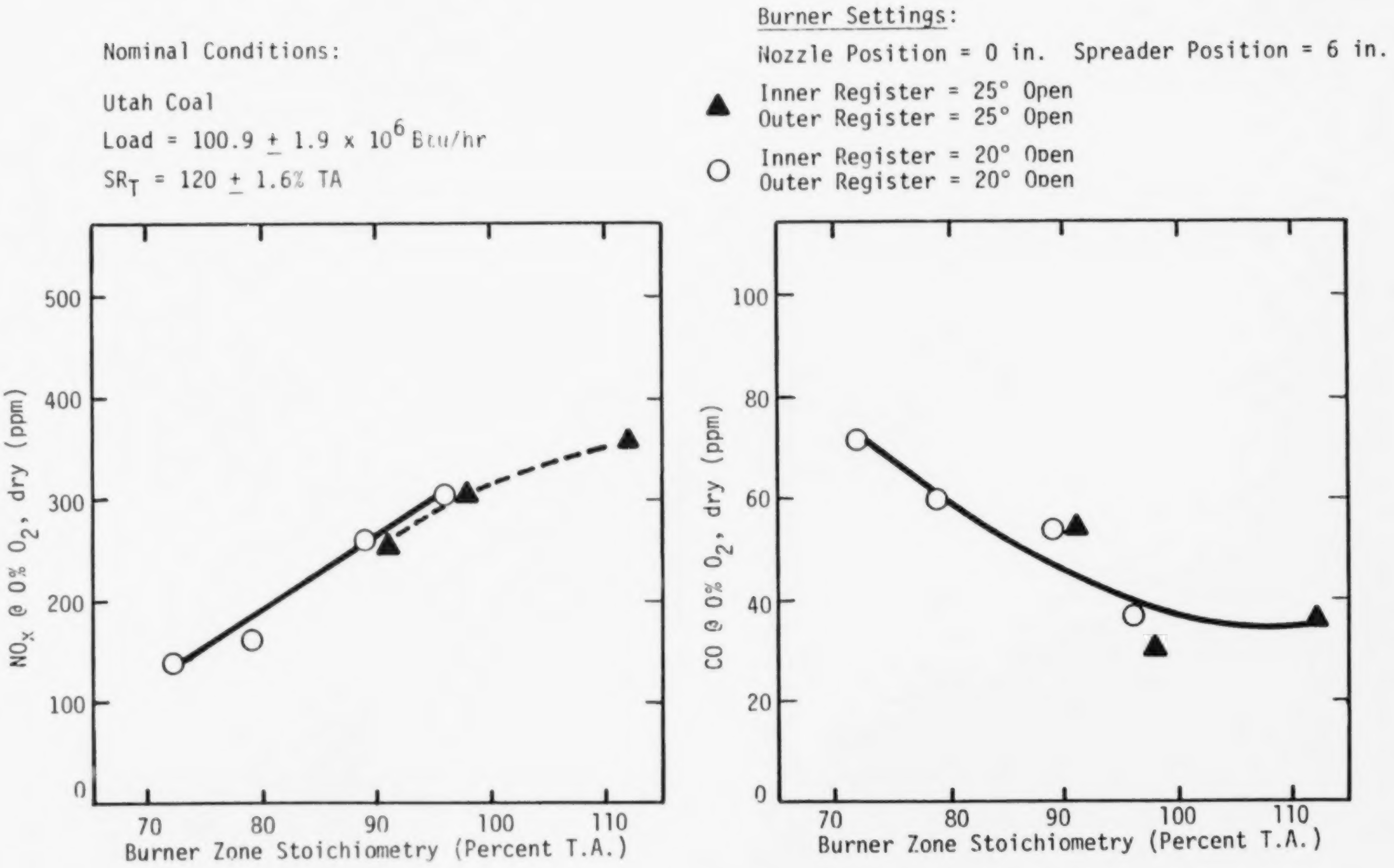
$SP_T = 123.7 \pm 4.7\%$ TA

Burner Settings:

Nozzle = 0 In.

Spreader = -6 In.

Figure 3-13. Effect of Register Position on Unstaged DMB Performance with Spreader #2 and 12-in. Tertiary Ports



Nominal Conditions:

Utah Coal

Load = 100.9 ± 1.9 x 10^6 Btu/hr

SR_T = 120 ± 1.6% TA

Burner Settings:

Nozzle Position = 0 in. Spreader Position = 6 in.

▲ Inner Register = 25° Open
Outer Register = 25° Open

○ Inner Register = 20° Open
Outer Register = 20° Open

Figure 3-14. Staged Performance of the DMB with Spreader #2 and 12-in. Tertiary Ports

carbon. Flame length increased to over 22 feet, with flame impinging on the rear wall of the furnace. This impingement again caused a quenching effect, suppressing NO_x formation and decreasing combustion efficiency.

Previous tests have shown that increasing tertiary air velocities tend to decrease flame length. Increasing the tertiary air velocities increases the mixing of the tertiary air jet with the flame by entrainment. Inserts were installed in the tertiary air ports to decrease the diameter from 12 inches to 8 inches. This resulted in increasing the tertiary velocity by a factor of 2.25. The length of the staged flame was shorter, with no flame impingement on the rear wall observed. As a result of the increased mixing, NO_x emissions increased to 194 ppm and the CO level was reduced to 42 ppm. The effect of tertiary port size and velocity is summarized in Figure 3-15.

The distribution of secondary air between the inner and outer passages was evaluated for optimum performance. The results are presented in Figure 3-16. Biasing the secondary air to the inner passage resulted in lower NO_x emissions as well as lengthening the flame such that it impacted the rear wall. Bias toward the outer secondary air passage also increased flame length but had no significant effect on emissions. Optimum flame length was achieved with an equal distribution of air to the parallel secondary air passages.

The position of the venturi nozzle was varied while maintaining the spreader in the same relative position, 6 inches back in the venturi. Table 3-1 summarizes the effects observed. The optimum coal nozzle position for spreader #2 design was -2 inches from baseline position. All other positions appeared to result in longer flames, impacting the rear wall.

TABLE 3-1. SUMMARY OF THE EFFECT OF NOZZLE POSITION ON RSC DMB PERFORMANCE WITH SPREADER #2 AT -6 IN. AND 8-IN. TERTIARY PORTS

Nozzle Position (in.)	NO_x @ 0% O_2 (ppm)	Flame Characteristics
-2	197	21 ft. long. No observed impingement
-3	112	Unstable, flame > 22 ft. long. Flame impinging on rear wall.
+1	146	Flame > 22 ft. long. Flame impinging on rear wall.

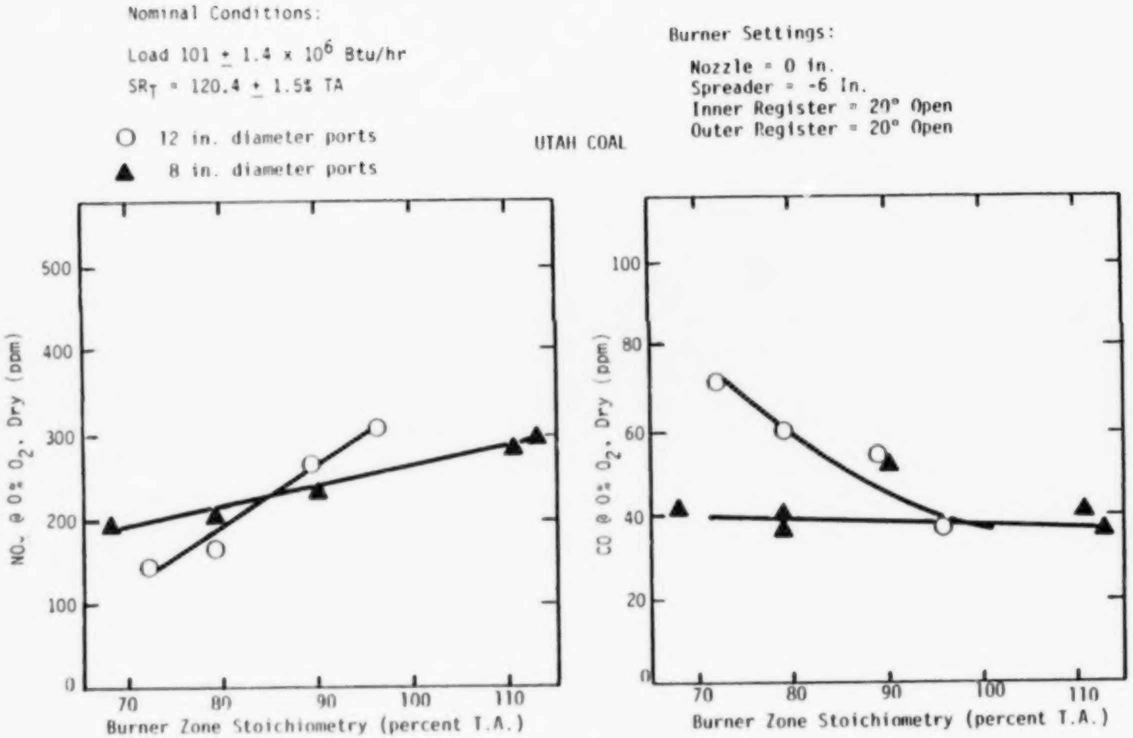
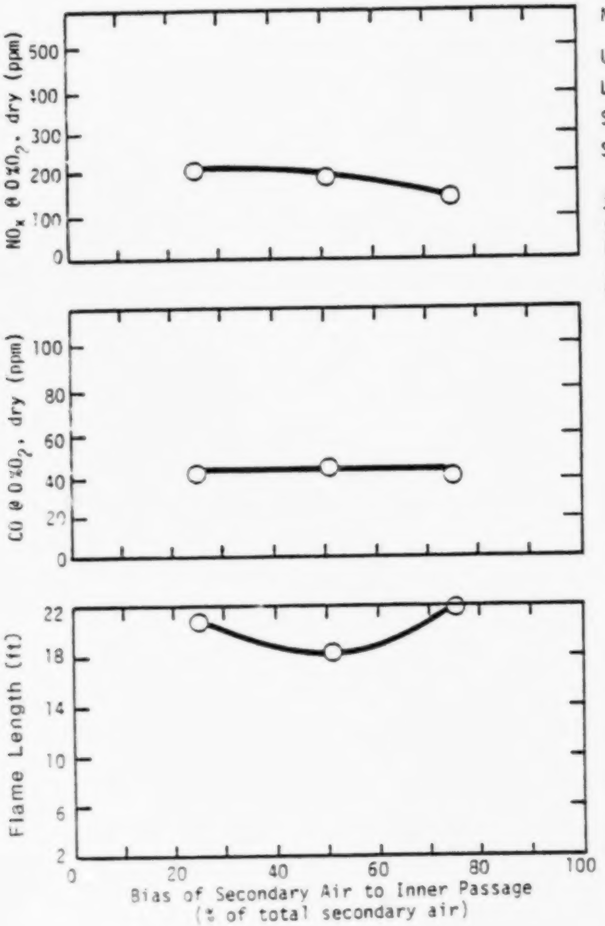


Figure 3-15. Effect of Tertiary Velocity on RSC DMB Staged Performance with Spreader #2



Nominal Conditions:

Utah Coal

Load = 102.2 ± 2.9 x 10^6 Btu/hr

SR_B = 69.0 ± 1.7% TA

SR_T = 121.0 ± 1.0% TA

Burner Settings:

Spreader = -6 in.
Nozzle = 0 in.
Inner Register = 20° Open
Outer Register = 20° Open

Figure 3-16. Effect of Secondary Air Distribution on Staged Performance DMB with Spreader #2 and 8-in. Tertiary Ports

The staged performance of the RSC DMB with spreader #2 and 8-in. tertiary ports at optimum burner settings is presented in Figures 3-17 and 3-18. Staging down to a burner zone stoichiometry of 70 percent TA from unstaged conditions reduced NO_x by 37 percent. Low levels of NO_x were achieved while maintaining low CO down to 15 percent excess air. Analysis of fly ash samples at these optimum conditions yielded about 22 percent carbon. This indicated that although visual observations showed no indication of impingement in sighting through the viewports, the flame may yet have been hitting the rear wall out of the angle of view.

As mentioned previously, this burner was equipped with a JB Systems, Inc., Iris combination infrared and ultraviolet flame scanner. This scanner was not connected to any control system, but provided information about the flame intensity. The flame scanner measures IR and UV radiation intensity and converts it to a 0-25 milliamp (ma) readout.

Under unstaged conditions with spreader No. 2, the readout was 23 ma. Staging the burner to SR_B equal to 0.8 dropped the scanner signal to 22 ma. At SR_B equal to 0.7, the signal was still 22 ma. In fact, even during extreme upsets such as greater than 4 ft. flame front standoff, the scanner detected a flame. Injection of sorbent into the flame zone did not affect scanner signal.

The RSC DMB was also equipped with a commercial Peabody electric arc ignitor. During the first few days of operation, the ignitor was successfully used to light off the oil flame. However, due to the wet environment of the LWS the spark plug used to produce the electrical arc failed. Because this was perceived to be a cronic problem of the system, the ignitor was removed from service. EERC used a propane torch as an ignitor for the remainder of the tests.

Tests were conducted with both the ignitor in place and retracted to see the effect of its presence in the inner secondary air passage. NO_x emissions were insensitive to ignitor and scanner position, CO emissions increased about 7 ppm with the ignitor in place.

3.2.2 Additional Developmental Optimization for Indiana and Illinois Coals

Acceptable flame length and stability could not be achieved when the Indiana coal was first fired in the RSC DMB in the configuration found to give good performance with the Utah coal. Figure 3-19 summarizes adjustments in nozzle and spreader positions in trying to achieve acceptable performance. The principle reason for the difference in performance between the Utah and Indiana coals appears to be due to significantly less volatiles in the Indiana coal, 34.26 percent, than in the Utah coal, 40.47 percent. Since burner

Nominal Conditions:

Utah Coal
Load = 100.8 ± 2.3 x 10^6 Btu/hr
SR_T = 120.9 ± 1.2% TA

Spreader Position = -6"
Nozzle Position = -2"
Inner Register = 20° Open
Outer Register = 20° Open

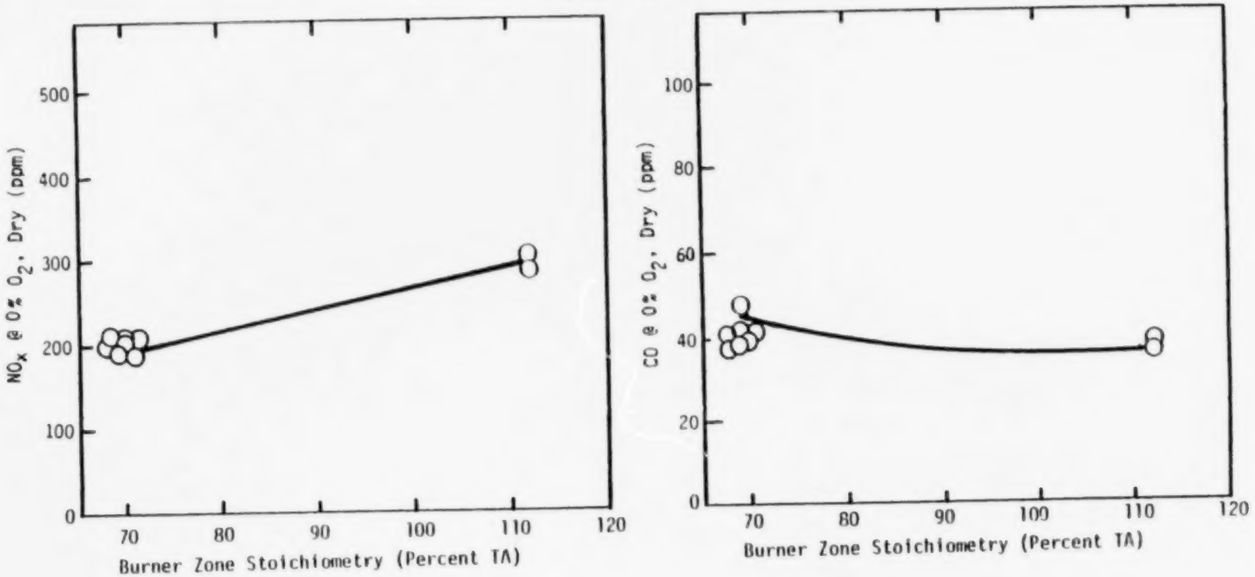


Figure 3-17. Staged RSC DMB Performance with Spreader #2 and 8" Tertiary Ports

Nominal Conditions:

Utah Coal

Load = 100.1 ± 2.1 x 10^6 Btu/hr

SR_B = 69.8 ± 2.3% TA

Spreader Position = -6"

Nozzle Position = -2"

Inner Register = 20^0 Open

Outer Register = 20^0 Open

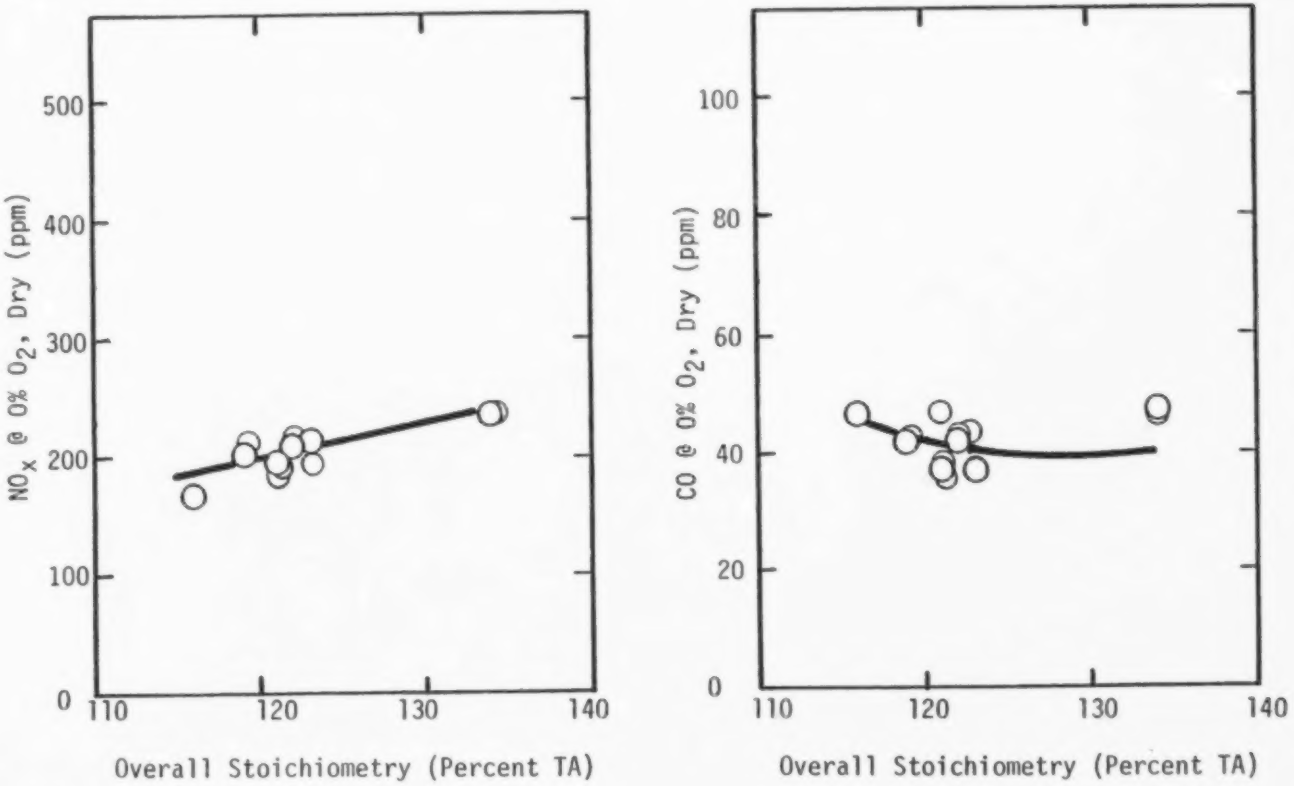


Figure 3-18. Effect of Excess Air on Staged RSC DMB Performance with Spreader #2 and 8-in. Tertiary Ports

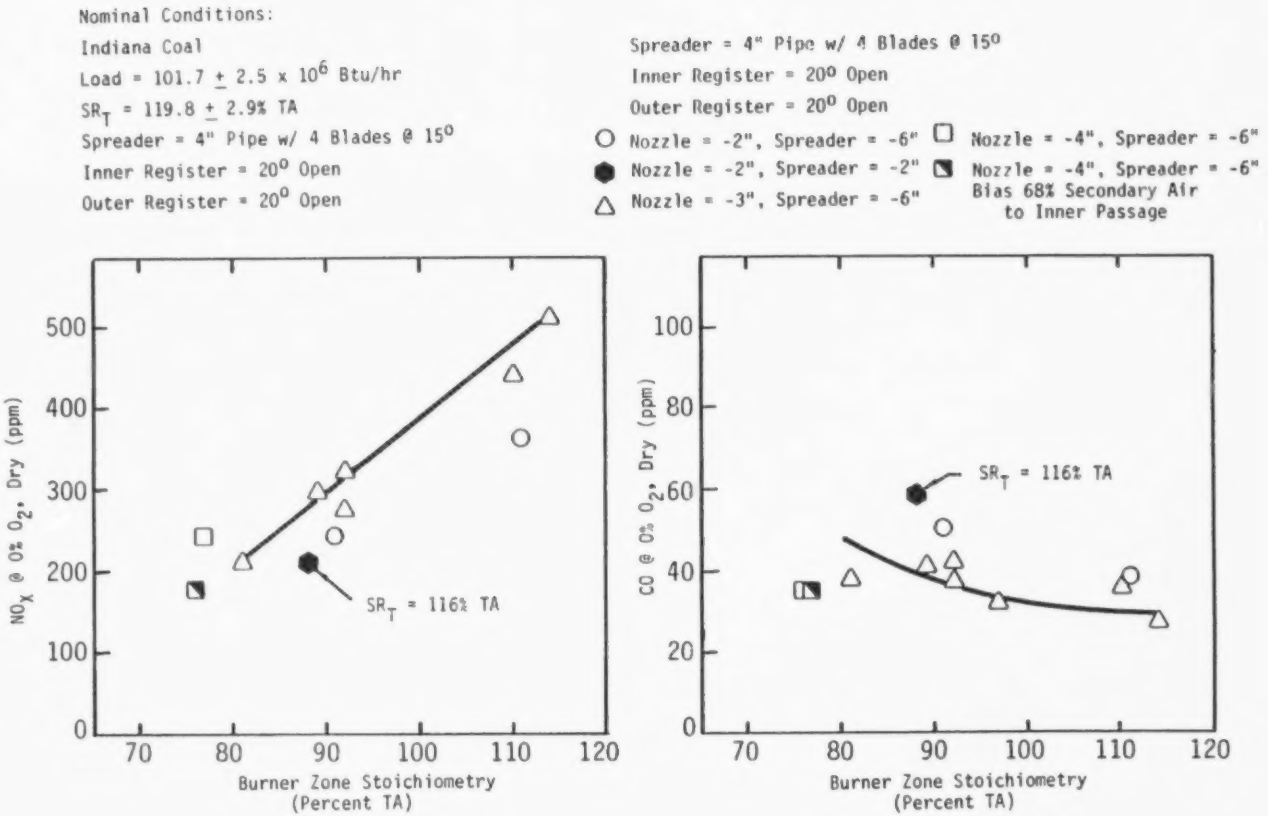


Figure 3-19. Effect of Spreader #2 and Nozzle Position on RSC DMB Performance with Indiana Coal

adjustments did not significantly improve burner performance, the spreader design was iteratively modified to achieve acceptable flame length, coal head pressure, and stability.

The spreader modifications involved altering blade positions and lengths using the 4-inch pipe of spreader #2 as the support tube, with the objective to improve mixing of the primary air and coal with the secondary air. Table 3-2 summarizes the development of the spreaders. The first modification, spreader #3, increased the angle of the blades from 15° to 35°. The resulting coal spreader produced a coal head pressure of over 14 in. H_2O and low primary velocity. It also caused combustion products to blow back through the spreader support pipe, which was uncapped and open to facilitate insertion of EERC's oil gun throughout all the tests. This "blowback" would not occur in practical installations where the spreader support pipe is normally either capped or fitted with an oil igniter.

TABLE 3-2. ITERATIVE DEVELOPMENT OF RSC DMB COAL SPREADERS FOR INDIANA COAL FIRING

Spreader Design	Performance Characteristics
#2. 4-in. pipe with four long blades @ 15°	Flame length > 22 ft.
#3. 4-in pipe with four long blades @ 35°	High coal head pressure, > 14-in. H_2O, resulting in low primary velocity. Combustion products blow back through spreader support pipe.
#4. 4-in. pipe with four short blades @ 35°	Coal head pressure high (14-in. H_2O)
#5. 4-in. pipe with four short blades @ 28°	Acceptable coal head pressure. Flame length 19-20 ft. under staged conditions.

To try to decrease the coal head pressure and blow back of combustion products, the length of the spreader #3 blades was reduced. When fired, the resulting spreader #4 did not improve performance. The coal head pressure remained excessively high at all spreader positions. The next modification was to reposition the blades of spreader #4 for a 28° angle. This spreader achieved acceptable performance, with stable flames under staged conditions and flame length between 19 and 20 feet.

The range of register vane positions that maintained acceptable combustion conditions was limited, 20° open or less. Figure 3-20 summarizes the staged performance with spreader #5. NO_x emissions with spreader #5 were substantially higher, 268 ppm, than those produced by spreader #2 with Utah coal, 193 ppm, while CO levels were comparable. More important, carbon burnout improved significantly.

No problems were experienced when the Illinois coal was fired with spreader #5. Flame stability at low load actually improved over the Indiana coal, due in part to the higher volatile matter content of the Illinois coal, 38.62 percent. The Utah coal was retested using the spreader #5 configuration with improved performance. Although NO_x emissions increased at the design point from 193 ppm to 233 ppm, flame length was significantly shorter and the carbon content of the fly ash was reduced from 22 percent to about 10 percent. NO_x emissions from the Utah coal were comparable to NO_x levels measured during tests of the other two fuels with spreader #5, as shown in Figure 3-20.

The effect of excess air on NO_x and CO is summarized in Figure 3-21. The emissions from the three fuels fall within a range of 40 ppm with an average slope of approximately 4 ppm/percent TA. The RSC DMB operated over a wide range of excess air, with transient data indicating the knee of the CO curve occurs at about 10 percent excess air.

Turndown capability was evaluated for each coal with the final spreader configuration. The results are presented in Figure 3-22. With the Utah and Illinois coals, it was possible to maintain stable staged operation SR_B equal to 70% TA down to 60 percent of full load. For the Indiana coal, it was necessary to decrease staging to a burner zone stoichiometry of 90 percent TA for stable operation at 60 x 10^6 Btu/hr. For each coal firing rate had small effect on NO_x emissions. NO_x emissions decreased between 10 and 16 percent when the firing rate was decreased from 100 x 10^6 Btu/hr to 60 x 10^6 Btu/hr. Combustion efficiency, as indicated by CO levels, did not change significantly.

3.3 COMPARISON OF BURNER PERFORMANCE

3.3.1 Performance Characteristics of RSC Burners

Key test conditions from the RSC burner tests are summarized in Table 3-3. Included in the table are descriptions of each test condition, NO_x and CO emissions, and analyses of representative fly

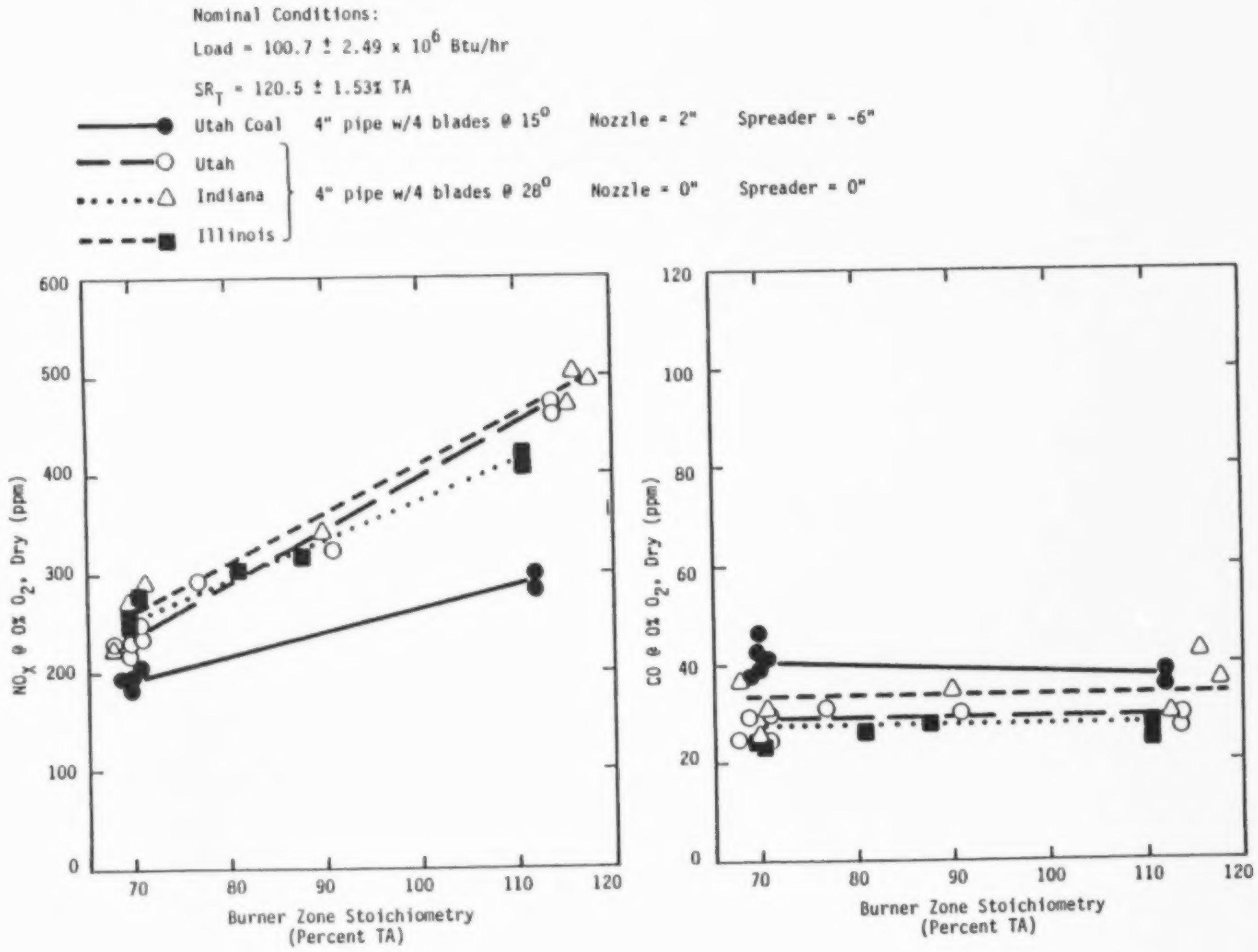


Figure 3-20. Summary of RSC DMB Performance

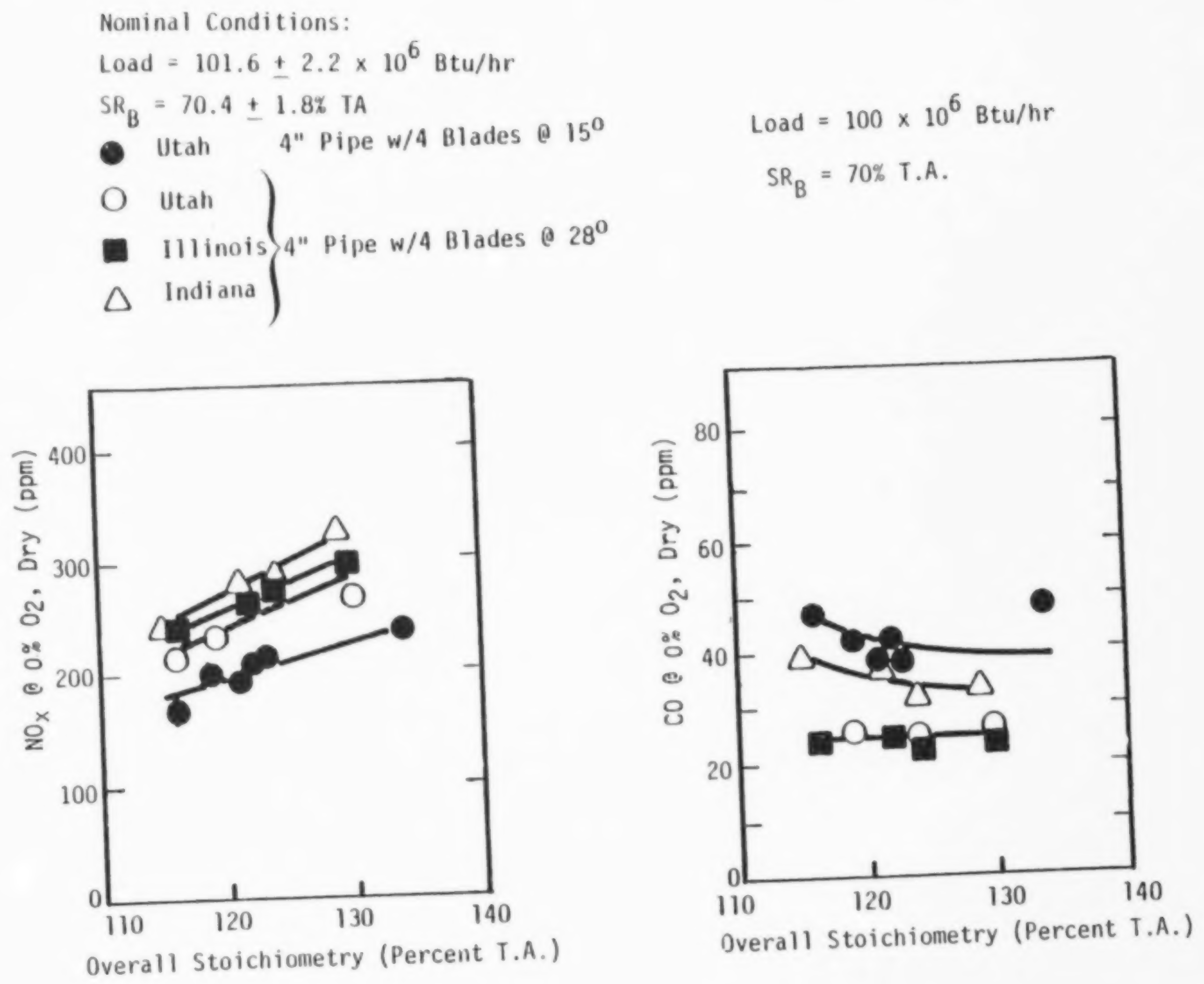


Figure 3-21. Effect of Excess Air on RSC DMB Emissions

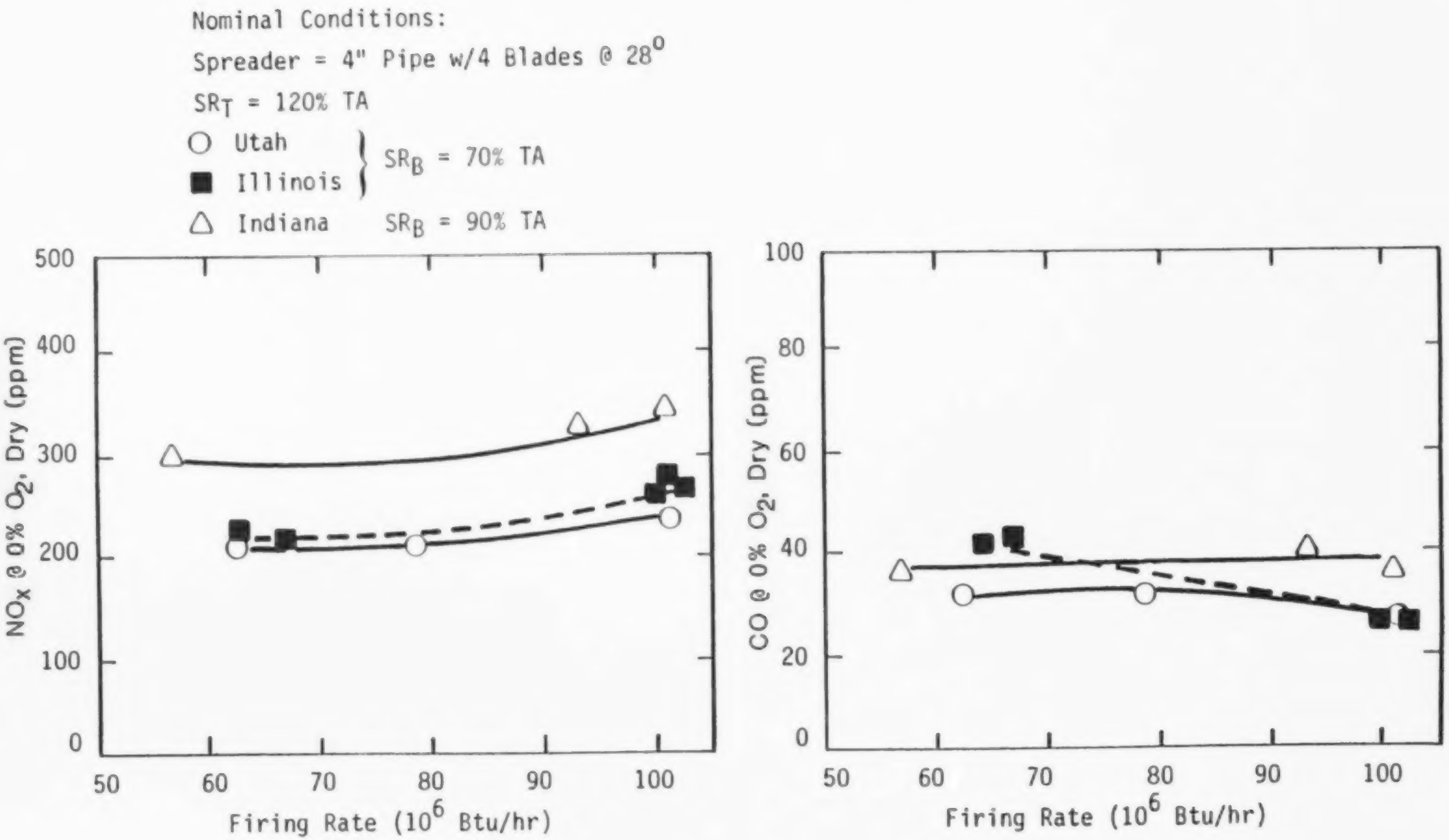


Figure 3-22. Effect of Load on RSC DMB Emissions with Optimized Spreader

TABLE 3-3. SUMMARY OF KEY RSC BURNER TESTS

Test No.	Burner	Illinois	Spreader Design	Firing Rate (x 10^6 Btu/hr)	SR_B (% TA)	SR_T (% TA)	PPM @ 0% O_2		Fly Ash Carbon (Wt %)	Carbon Burn-out (%)
							NOx	CO		
8.07	Flare 100	Utah	Flare	103.3	118	118	688	48	5.47	99.30
9.06	Flare 100	Illinois	Flare	100.1	122	122	672	43	3.85	99.28
1.11	CCV 100	Utah	BL Cone	98.3	121	121	304	55	14.83	97.91
2.05	CCV 100	Illinois	BL Cone	101.4	120	120	398	48	4.33	99.27
5.06	CCV 100	Utah	#5	103.7	119	119	720	44	3.88	99.52
6.01	CCV 100	Utah	#5L	103.1	118	120	465	48	6.88	99.13
6.06	CCV 100	Utah	#5L	105.0	72	119	274	54	9.33	99.12
18.4	DMB	Utah	#5	101.4	71	119	234	26	10.14	98.30
16.4	DMB	Illinois	#5	102.7	70	122	264	25	6.19	99.00
14.2	DMB	Indiana	#5	99.3	72	121	280	37	8.01	98.78
16.1	DMB	Illinois	#5	97.4	111	119	408	25	5.02	99.20
18.1	DMB	Utah	#5	98.8	114	121	461	30	7.97	98.57
10.01	Flare 50	Utah	Flare	44.8	125	125	553	63	4.65	99.40
11.08	CCV 50	Illinois	BL Cone	51.5	120	120	396	78	5.35	98.98
21.2	DMB	Utah	#5	63.1	71	121	229	27	15.71	96.73
16.9	DMB	Illinois	#5	67.0	70	121	219	43	7.81	98.70
3.04	CCV 100	Illinois	BL Cone	56.6	120	120	157	109	5.44	99.08
4.01	CCV 100	Utah	BL Cone	58.5	117	117	153	86	7.45	99.04

ash samples. Also included is an indication of relative combustion efficiency, carbon burnout. Carbon burnout (C_b) is based on the carbon in the fly ash and can be defined as:

$$C_b = 1 - \frac{\frac{C_p}{A_p}}{\frac{C_c}{A_c}} \times 100\%$$

where: C_p is equal to percent carbon in particulate matter
A_p is equal to percent ash in particulate matter
C_c is equal to percent carbon in coal
A_c is equal to percent ash in coal

At optimum unstaged full load operation with Utah coal, the 100 x 10^6 Btu/hr CCV burners with spreader #5 achieved the highest carbon burnout 99.52. This is comparable to the 100 x 10^6 Btu/hr Flare and 100 x 10^6 Btu/hr CCV burner with spreader #5L with 99.30 and 99.13 percent carbon burnout, respectively. The 100 x 10^6 Btu/hr CCV with the baseline conical spreader resulted in significantly lower burnout, 97.91 percent. For Illinois coal, the 100 x 10^6 Btu/hr CCV burner equipped with the cone spreader and the 100 x 10^6 Btu/hr Flare burner both achieved good efficiency with C_b equal to 99.3 percent.

Combustion efficiency was slightly decreased with the RSC DMB at unstaged conditions to 99.20 and 98.57 percent for Illinois and Utah coal, respectively. There was no significant effect of carbon burnout due to staging for either the 100 x 10^6 Btu/hr CCV or the DMB for either of the coals tested.

Reduction of firing rate to approximately 50-60 percent capacity resulted in a slight decrease in efficiency. For the 100 x 10^6 Btu/hr CCV burner with the baseline cone spreader, carbon burnout was reduced by about 0.3 percent for both Illinois and Utah coals. The DMB showed a greater loss in efficiency as load was reduced to 60 percent of capacity with Utah coal. The scaled-down 50 x 10^6 Btu/hr Flare and CCV burners both achieved efficiencies similar to the fullscale burners, with carbon burnout of 99.4 and 99.04 percent, respectively.

Characteristic performance curves were obtained for each burner configuration and coal. The unstaged performance of the 100 x 10^6 Btu/hr burners is compared in Figure 3-23. Excess air had the greatest effect on the Flare burner with a rate of decrease of 14 ppm NO_x/percent TA. The Flare burner also operated over the widest excess air range, with the CO "knee" occurring at about 10 percent excess air. NO_x emissions from the 100 x 10^6 Btu/hr CCV burner with the

Nominal Conditions:

Fuel--Utah

Unstaged Operation

Firing Rate = 101.2 ± 2.2 x 10^6 Btu/hr

	Burner	Spreader Design/Pos.(In.)	Register Position (° Open)
○	DMB	BL Cone/-7	25/25
□	Flare	Flare/0	55
◆	CCV	BL Cone/-6	30

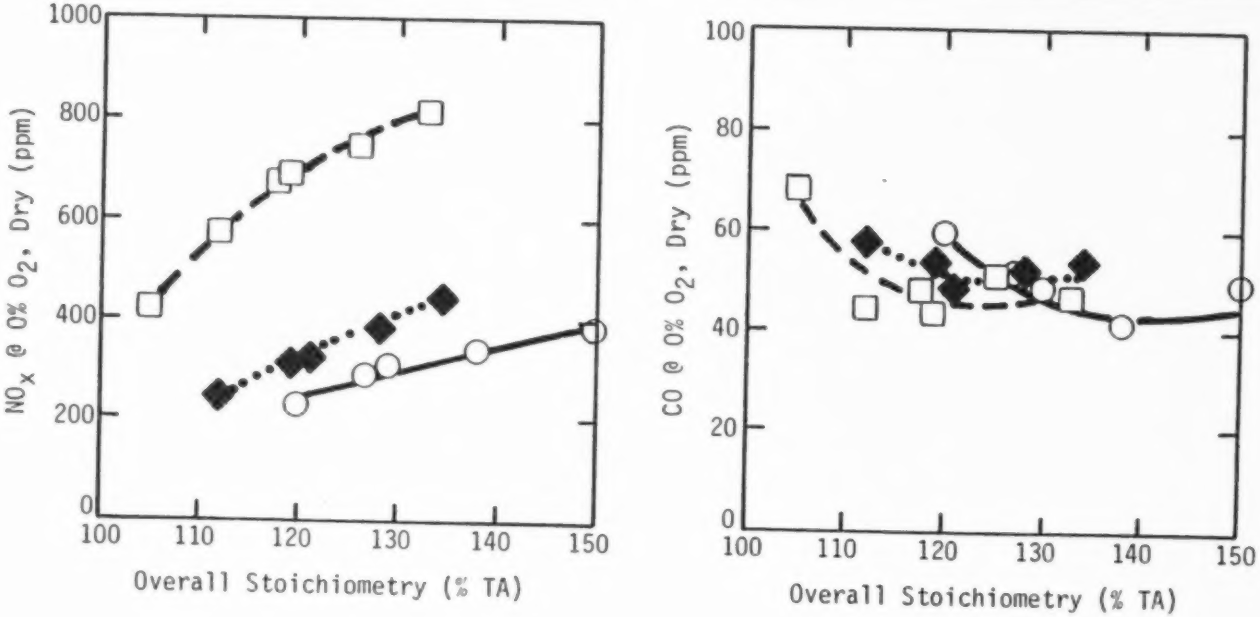


Figure 3-23. Summary of Unstaged Performance for the 100 x 10^6 Btu/hr RSC Burners

baseline cone spreader decreased linearly at 9 ppm/percent TA. Excess air had the least effect on the DMB equipped with the baseline cone spreader decreasing at 6 ppm/percent TA.

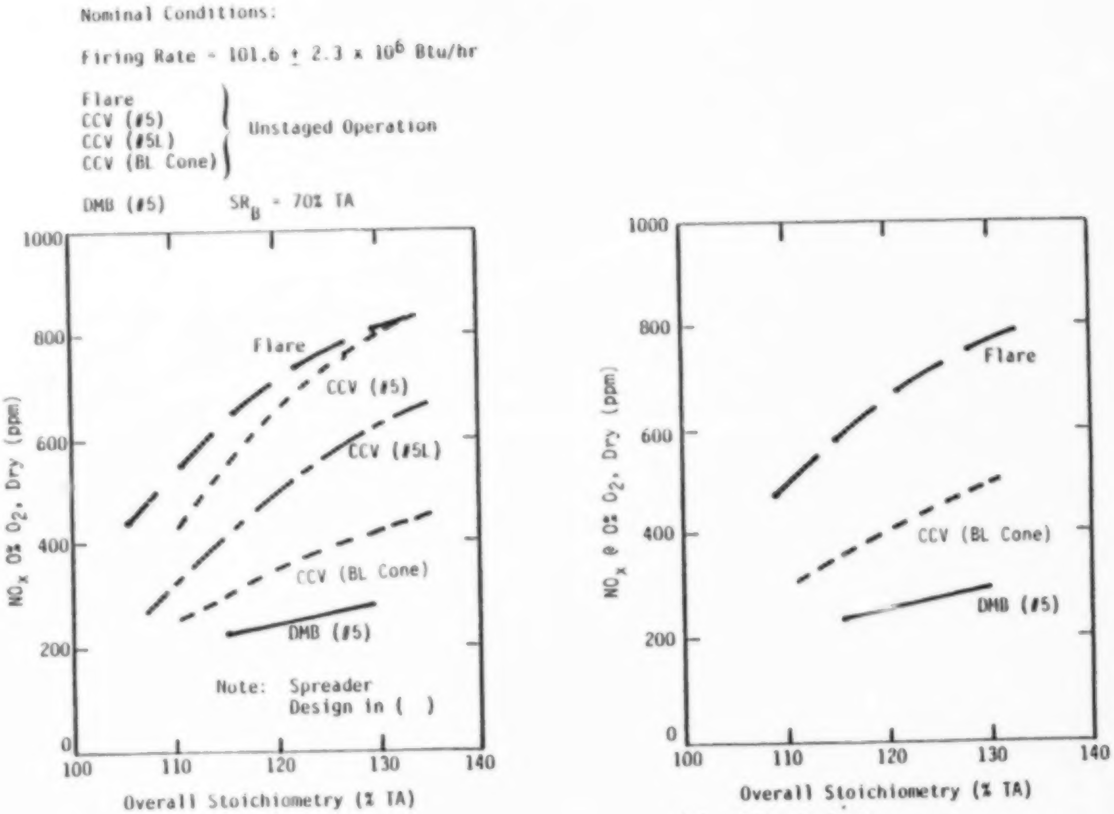
At design point conditions, SR_T equal to 120% TA, the NO_x emissions were lowest for the DMB, 235 ppm. The 100 x 10^6 Btu/hr CCV and Flare burners produced NO_x emissions of about 330 and 700 ppm, respectively. CO emissions were lowest for the Flare burner, 46 ppm, while the CCV burner and DMB equipped with the BL cone spreader produced 51 and 60 ppm, respectively. The conical spreader produced long, narrow flames, 20-22 ft, for the CCV burner and DMB, resulting in much lower NO_x emissions than from the short 14-foot flame produced by the Flare burner for unstaged conditions

The performance of the optimum configuration of the DMB is compared to the LWS performance of the two commercial burner designs in Figure 3-24 for both Utah and Illinois coals. The DMB data shown represent optimum staged conditions with an SR_B equal to 70 percent TA, while the data for the other burners are for nominal unstaged conditions utilized in field installations. The lowest NO_x emissions for the excess air range of 10 to 30 percent were achieved by the DMB with the Utah coal, 240 ppm at 20 percent excess air, and with the Illinois coal, 255 ppm. Highest NO_x emissions were measured for the Flare burner for both coals, 710 ppm and 650 ppm for Utah and Illinois, respectively. The CCV configuration used at CILCO Duck Creek Unit 1, the BL cone spreader, produced NO_x emissions of 330 and 400 ppm at 20 percent excess air, for Utah and Illinois coal, respectively.

The CCV burner, equipped with spreader #5L, was staged to evaluate the applicability of the DMB concept to a single register RSC burner. The results are compared to the emissions from the optimum RSC DMB configuration in Figure 3-25. Effect of burner zone stoichiometry is similar for the two burners with NO_x varying at 6 ppm/percent TA. The NO_x emissions from the dual register, RSC DMB were about 50 ppm lower than the staged CCV burner at an SR_B of 70 percent TA. CO emissions were about 20 ppm higher for the CCV burner and more sensitive to staging at low burner zone stoichiometries. Flame characteristics were similar for both burners, with stable flame about 20-21 feet in length.

3.3.2 Extrapolation of LWS Results to Operating Boilers

Changes in furnace thermal environment can affect burner performance, particularly pollutant emissions such as NO_x. As furnaces increase in size, the surface to volume ratio of the furnace decreases. The furnace volume is determined by residence time which remains relatively constant. Therefore, the amount of cooling surface per unit heat input will decrease as heat input increases changing the thermal environment of the furnace. To help compensate for these



(a) Utah Coal

(b) Illinois Coal

Figure 3-24. Comparison of Optimum Performance of RSC Burners in the LWS

Nominal Conditions:

Fuel = Utah

Firing Rate = 101.7 ± 2.96 x 10^6 Btu/hr

SR_T = 120.6 ± 0.7% TA

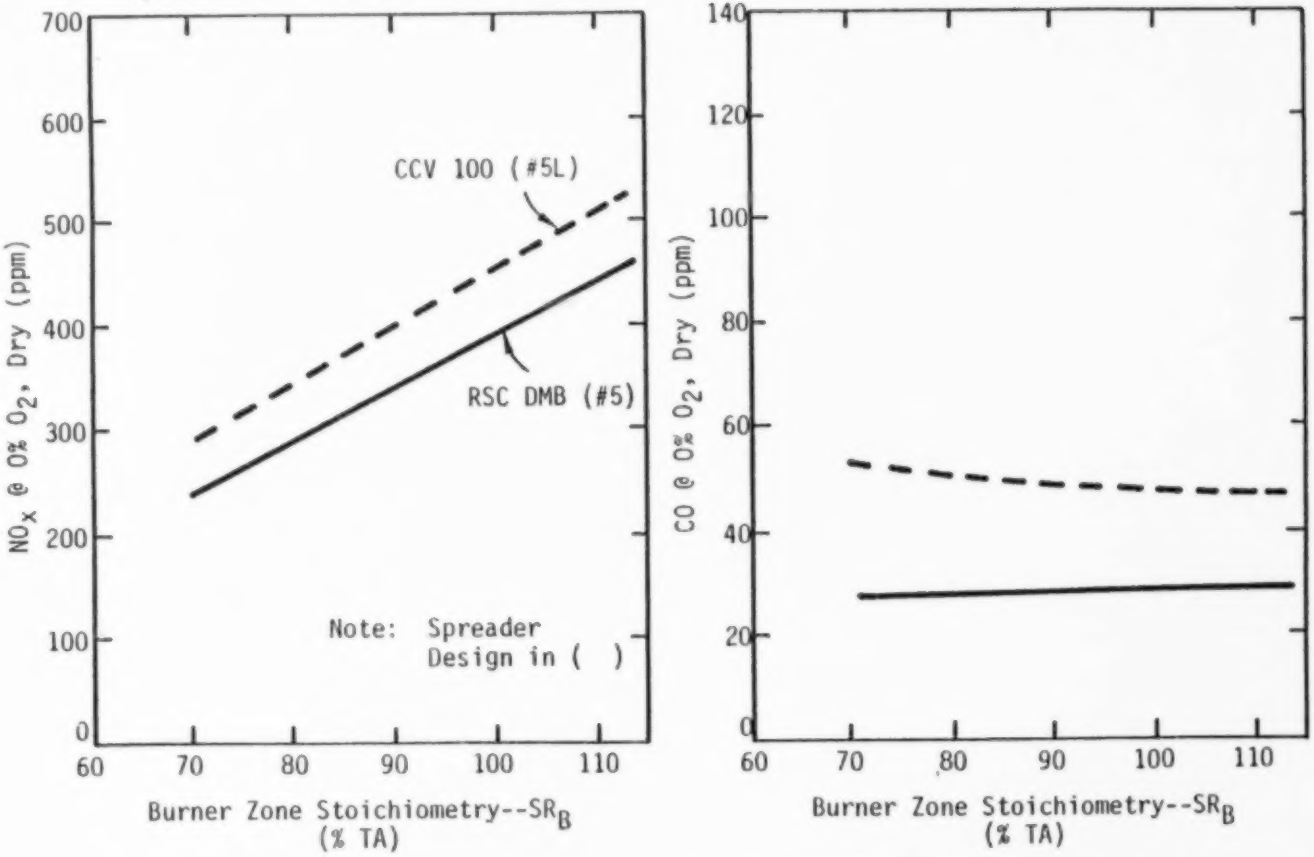


Figure 3-25. Staging Characteristics of the 100 x 10^6 Btu/hr RSC DMB and CCV Burner

effects the cooling surfaces in pilot-scale furnaces are lined with refractory to more closely simulate the environment of operating boilers. However, it is still necessary to relate pilot-scale furnace and burner performance to practical systems.

In order to relate NO_x emissions from the LWS to full-scale furnaces, two additional Riley Stoker burners, the Flare burner and CCV burner, were test fired in the LWS. The Flare burner is a pre-NSPS circular burner which has undergone extensive field testing as well as pilot-scale testing sponsored by Riley in EERC's Medium Tunnel (MT) and Riley Stoker's Coal Burner Test Facility (CBTF). The CCV burner, a first generation low-NO_x burner has also been tested in the MT and CBTF and retrofitted to three utility boilers.

Table 3-4 shows the burner and furnace combinations which were used to develop the NO_x extrapolation. It should be noted that some of the available pilot-scale data was not used. This data was not included because of possible differences in burner aerodynamics caused by part load operation and variations in tertiary air port design(8).

TABLE 3-4. NO_X EMISSIONS DATA BASE

Furnace	MT	LWS		CBTF	FIELD
Burner / 10^6 Btu/hr	50	100	50	100	100 – 150
Flare	X	X	●	X	X
CCV Cone Spreader	X	X	X	X	X
CCV Straight Spreader	–	X	–	X	–
CCV-MS	O	X	–	O	–
DMB	O	X	–	–	–

X Data Used in Correlation
● Part Load Data
O Preliminary Burner Designs

Riley Stoker uses a Burner Area Heat Release (BAHR) parameter to rank the thermal environment of different furnaces. BAHR is the ratio of gross heat release rate to cooling surface in the burner zone. The burner zone itself can be defined in various ways with each boiler manufacturer having their own definition.

The burner area used by Riley Stoker is defined for wall-fired furnaces in Figure 3-26. The burner area includes the furnace walls in the burner zone and a projected plane at the bottom of the burner zone. For this analysis the EPA LWS was evaluated as a wall-fired furnace. Flame observations in tunnel-fired furnaces have shown the unstaged flame to be about eight burner diameters long. Figure 3-27 shows the burner area for MT and CBTF.

To account for the effect of refractory, the theoretical impedence to heat transfer for the furnace wall plus refractory is divided by the theoretical impedence to heat transfer for the bare wall for the furnace alone. The wall area covered by refractory is multiplied by this effectiveness factor and added to the bare wall surface area. Table 3-5 lists the effectiveness factor, burner zone area and BAHR for all three pilot-scale facilities.

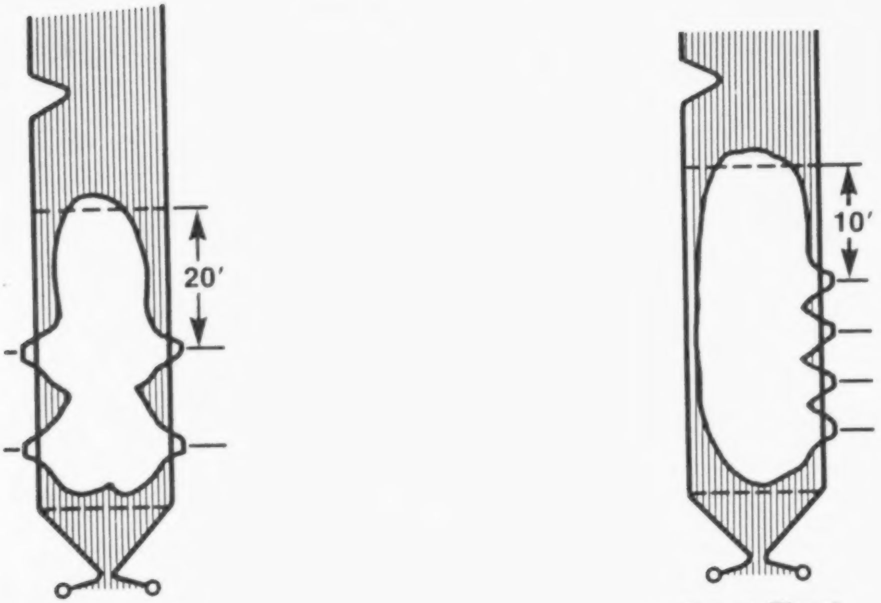
TABLE 3-5. THERMAL CHARACTERISTICS OF PILOT SCALE FURNACES

Furnace	Heat Input 10^6 Btu/hr	Refractory Effectiveness	Burner Area ft^2	Burner Area Heat Release 10^3 Btu/hr-ft^2
Riley Stoker CBTF	100	0.3	750	133.4
EPA LWS	100	0.6	1236	80.9
EERC MT	50	0.4	607	82.4

In order to eliminate operating variables in evaluating NO_x emissions for the extrapolation the following were used as standard conditions:

- 100 percent burner load
- SR_T equal to 1.2
- SR_B equal to 0.7 (staged combustion only).

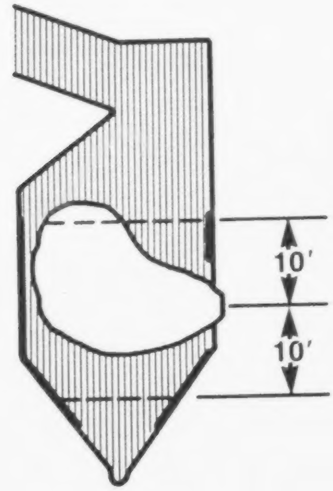
The NO_x emissions correlation which resulted from this analysis is shown in Figure 3-28. The relationship between NO_x and BAHR was linear for both the Flare burner and the CCV burner with BL cone spreader, with very similar slopes. Therefore, NO_x emissions for the other low-NO_x burners were extrapolated parallel to the line for the CCV burner with the cone spreader.



Horizontal Opposed Fired

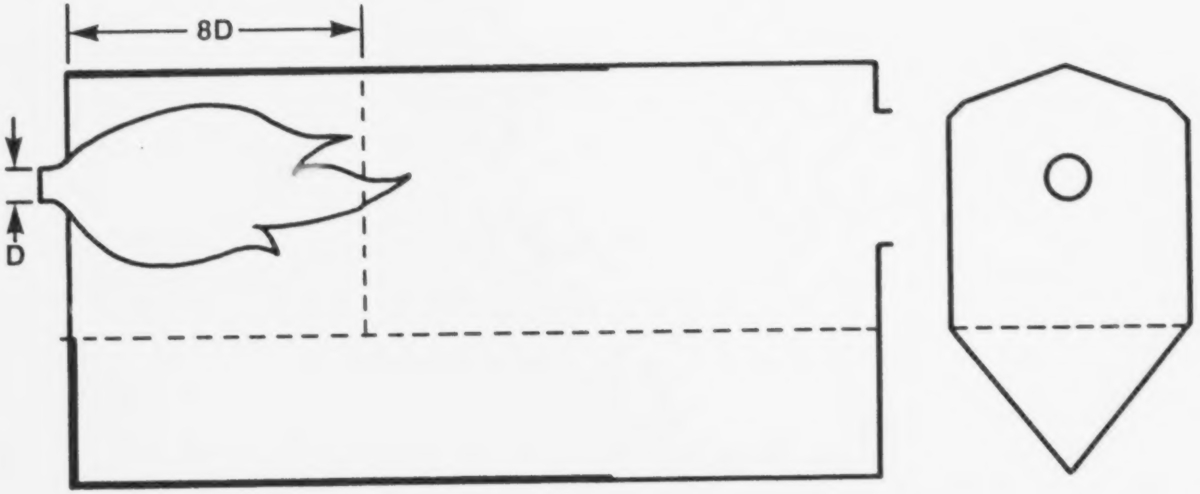
Front Fired

Utility Furnaces

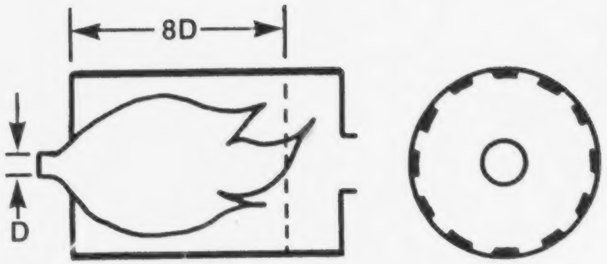


EPA-LWS

Figure 3-26. Burner Area in Wall-Fired Furnaces and the EPA LWS



RILEY STOKER CBTF



EERC MT

Figure 3-27. Burner Area in the Riley Stoker CBTF and the EERC MT

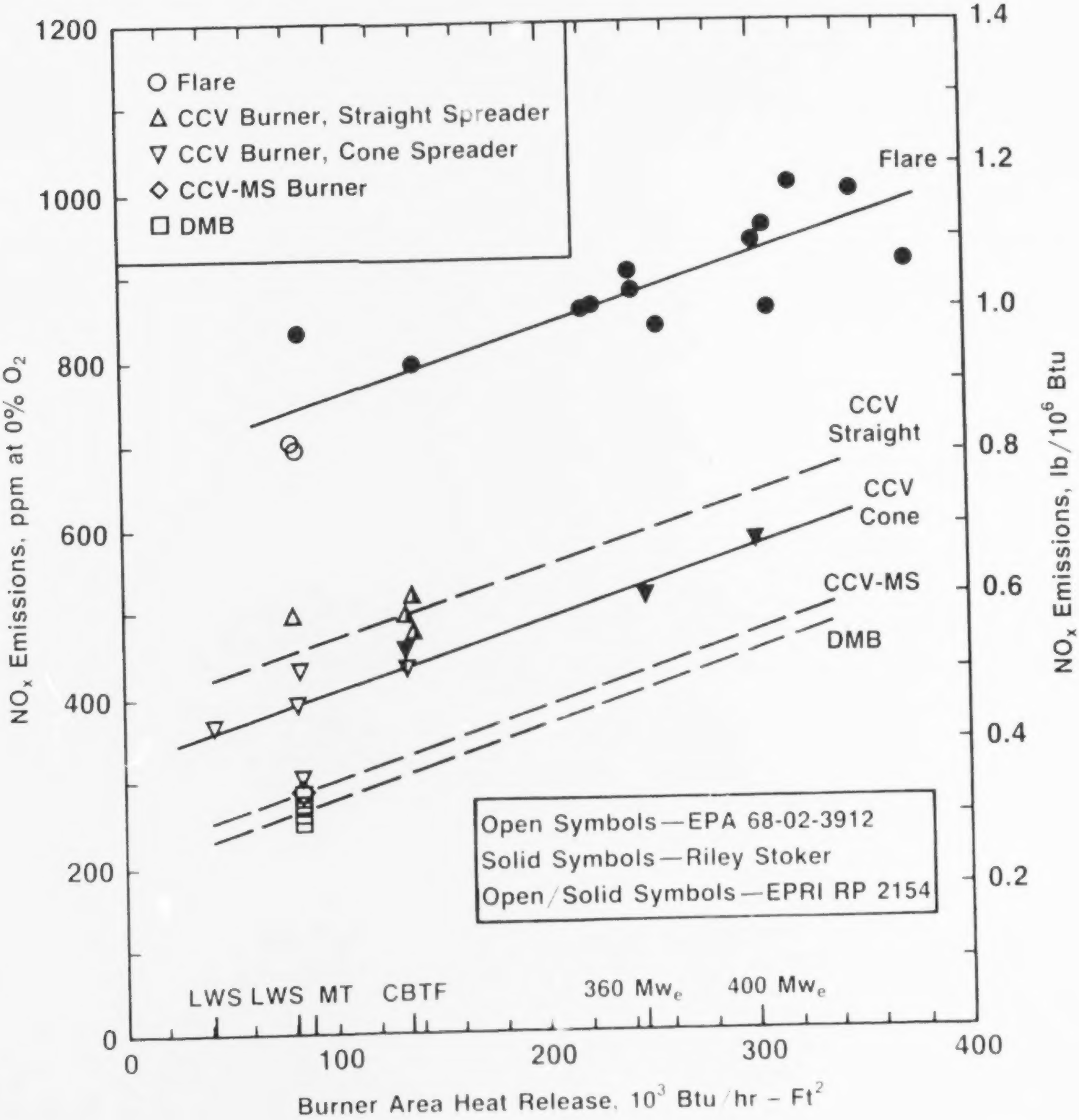


Figure 3-28. Projected NO_X Emissions From Riley Stoker Burners

Full-scale NO_x emissions could be as much as about 200 ppm higher than at pilot-scale. This is an increase of 20 to 45 percent depending on the level of pilot-scale NO_x emissions. These extrapolations also predict that NO_x emissions from utility boilers can be reduced by 50 to 60 percent from pre-NSPS levels using low NO_x burners. Other factors such as the degree of flame interaction in large multiple burner units can also affect emissions. Because scaling and extrapolation from research furnaces to multiburner installation is not completely understood, this prediction should be considered only an estimate.

3.3.3 Comparison of RSC DMB Performance With Other Low-NO_x Burners

The NO_x emissions from the RSC DMB and 100 x 10^6 Btu/hr CCV burner are compared with other burners tested in the EPA LWS in Figure 3-29. The data for the burners are shown for 20 percent excess air, the operating point for the RSC burners, and optimum burner settings for each burner. A common excess air level is necessary for comparing emissions since NO_x emissions are generally sensitive to excess air. The data shown are for nominal full-load operation, with rated firing rates of 70 x 10^6 Btu/hr for burner A and 100 x 10^6 Btu/hr for burners B and C and the two RSC burners.

The trend in NO_x emissions with staging is similar for burner B and the RSC DMB and CCV, and also for the pair of burners A and C. The emissions from the RSC DMB, CCV, and burner B are less sensitive to burner zone stoichiometries than are burners A and C. Overall, the lowest emissions were achieved with the 70 x 10^6 Btu/hr burner A. The RSC DMB yielded the lowest emissions of the 100 x 10^6 Btu/hr burners throughout the range tested.

At the design point burner zone stoichiometry of 70 percent TA, the RSC DMB and burner C produced similar emissions. These two burners produced significantly lower NO_x than the RSC CCV burner and burner B, which also had comparable emissions. The RSC DMB also produced the lowest NO_x emissions of the 100 x 10^6 burners with the Indiana coal and was only slightly higher than the 70 x 10^6 Btu/hr A at SR_B equal to 70 percent TA. Fuel composition had essentially no effect on emissions from the RSC DMB or burner A. However, NO_x emissions were approximately 100 ppm higher with Indiana coal than Utah coal for burners B and C.

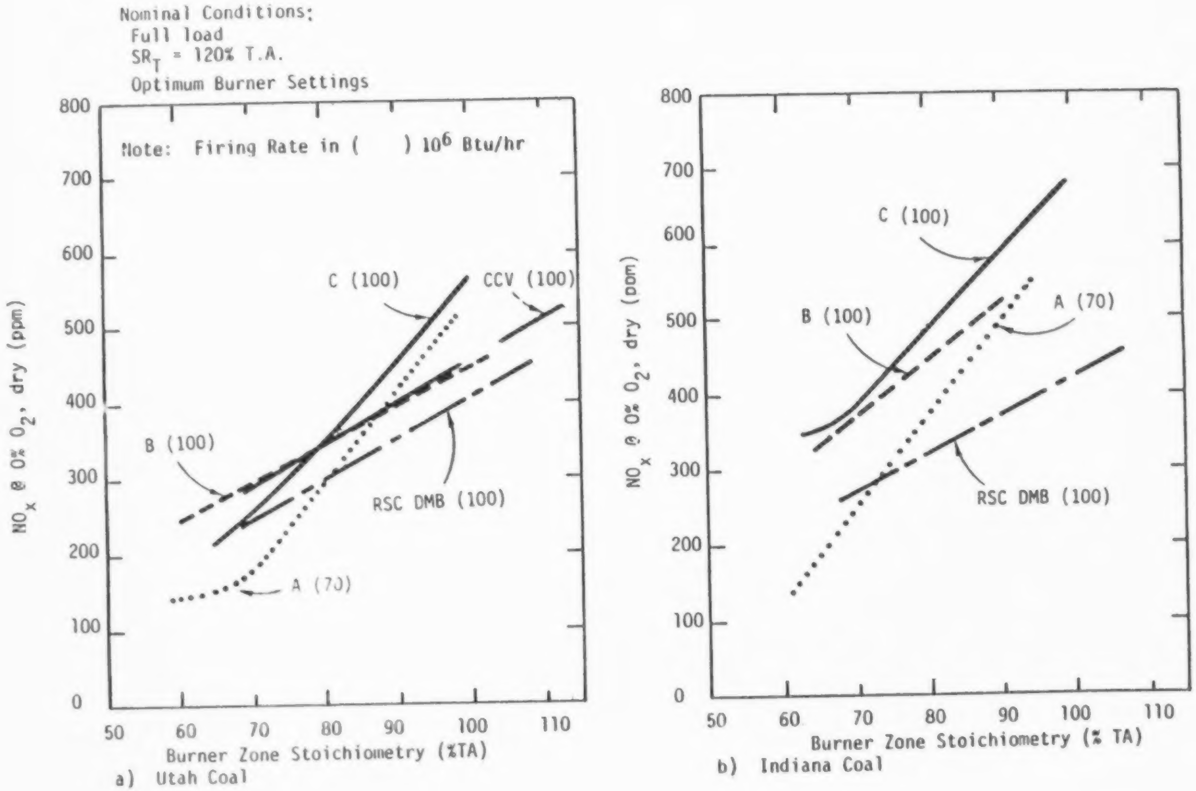


Figure 3-29. Comparison of NO_x Emissions for Burners Tested in the LWS

SECTION 4

SO_2 REDUCTION POTENTIAL WITH SORBENT INJECTION

The LIMB (Limestone Injection Multistage Burner) concept for SO_2 reduction by the addition of dry sorbent materials through the burner passages was evaluated with the RSC DMB and both RSC commercial burners, the Flare and CCV. The following operating variables were considered in optimizing for SO_2 capture for each burner configuration:

1. Fuel Composition
2. Sorbent Composition
3. Injection Location
4. Sorbent Feed Rate
5. Burner Variables (DMB Only)
6. Injection Velocity (DMB Only)

4.1 RSC DMB

4.1.1 Sorbent Injection With Utah Coal

The potential of SO_2 reduction was evaluated for both spreader #2 and spreader #5 with Utah coal. Figure 4-1 summarizes the results from the sorbent injection tests with Utah coal. For the first configuration, shown as the open symbols, injection of the hydrated lime through the tertiary ports yielded the highest capture. Reduction of SO_2 was lowest with injection of Vicron through the tertiary ports and the addition of lime with the coal.

Previous tests with bituminous coals have consistently shown that injection of hydrated lime with the coal is generally low when compared to other sorbent and injection combinations. This is probably due in part to the susceptibility of hydrated lime to deactivation in the high-temperature central regions of the flame. Another contributing factor considered is the interaction of the coal

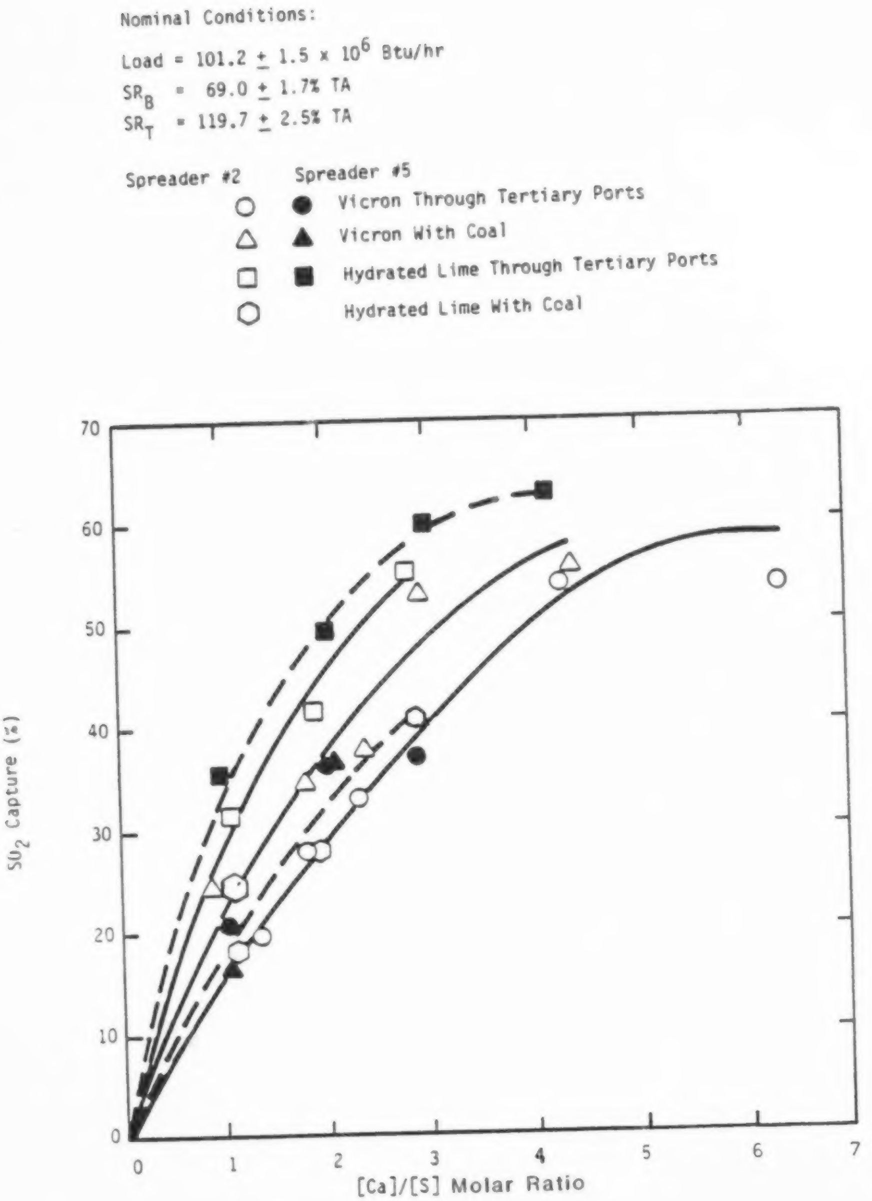


Figure 4-1. Summary of Sorbent Injection with Utah Coal

mineral matter with the sorbent particles. At elevated temperatures this can diminish the available calcined sorbent surface area. Injection of Vicron with the coal with this initial spreader configuration produced significantly better capture, 37 percent at Ca/S equal to 2.0, than injection of the same material through the tertiary ports, 29 percent at Ca/S equal to 2.0.

Sorbent injection tests with spreader #5, also included in Figure 4-1, produced somewhat different results. The best capture for the sorbent/injection combinations evaluated was again achieved with the injection of lime through the tertiary ports. Sulfur capture by hydrated lime injected through the tertiaries was 49 percent at Ca/S equal to 2.0 for spreader #5, higher than the capture achieved under comparable conditions with spreader #2, 45 percent at Ca/S equal to 2.0.

With the second spreader design, there was no significant difference between the captures achieved with Vicron injected through the tertiaries or with the coal. The average capture with Ca/S equal to 2.0 was 33 percent for spreader #5 with Vicron addition in either location. This is lower than the capture with Vicron through the mill, 37 percent, but higher than with Vicron through the tertiaries, 29 percent, for the first configuration. The differences may be due to changes in mixing and recirculation patterns produced by the two spreader designs. Burner performance, discussed in Section 4, was substantially different, with spreader #5 producing a slightly shorter flame with corresponding higher NO_x emissions and improved efficiency.

Perturbations in burner variables were made while injecting Vicron through the tertiary ports to evaluate the potential of tuning the RSC DMB to enhance SO_2 capture. The sensitivity of the RSC DMB performance to variations in burner parameters limited the range of the perturbations. The results of these burner adjustments on sulfur capture are compared to the capture achieved at the "NO_x-Optimized" settings in Figure 4-2. None of the changes in burner settings improved capture significantly. Only the retraction of the coal nozzle 2 inches yielded SO_2 reduction comparable to that achieved with the optimum settings. However, flame stability was diminished and a very short flame was produced as a result of the nozzle retraction. Burner performance for each adjustment is listed in Table 4-1.

The results of these tests indicate that, for the RSC DMB, optimum performance for both NO_x and SO_2 reduction is achieved with the same burner conditions. Developments in the understanding of the LIMB process have not yet clearly identified the relative importance of "near-field" phenomena. The interaction of the sorbent jet with the flame, and the effect on sorbent calcination and activation, is for example poorly understood in large-scale systems. The large changes in SO_2 capture measured during these tests could therefore be

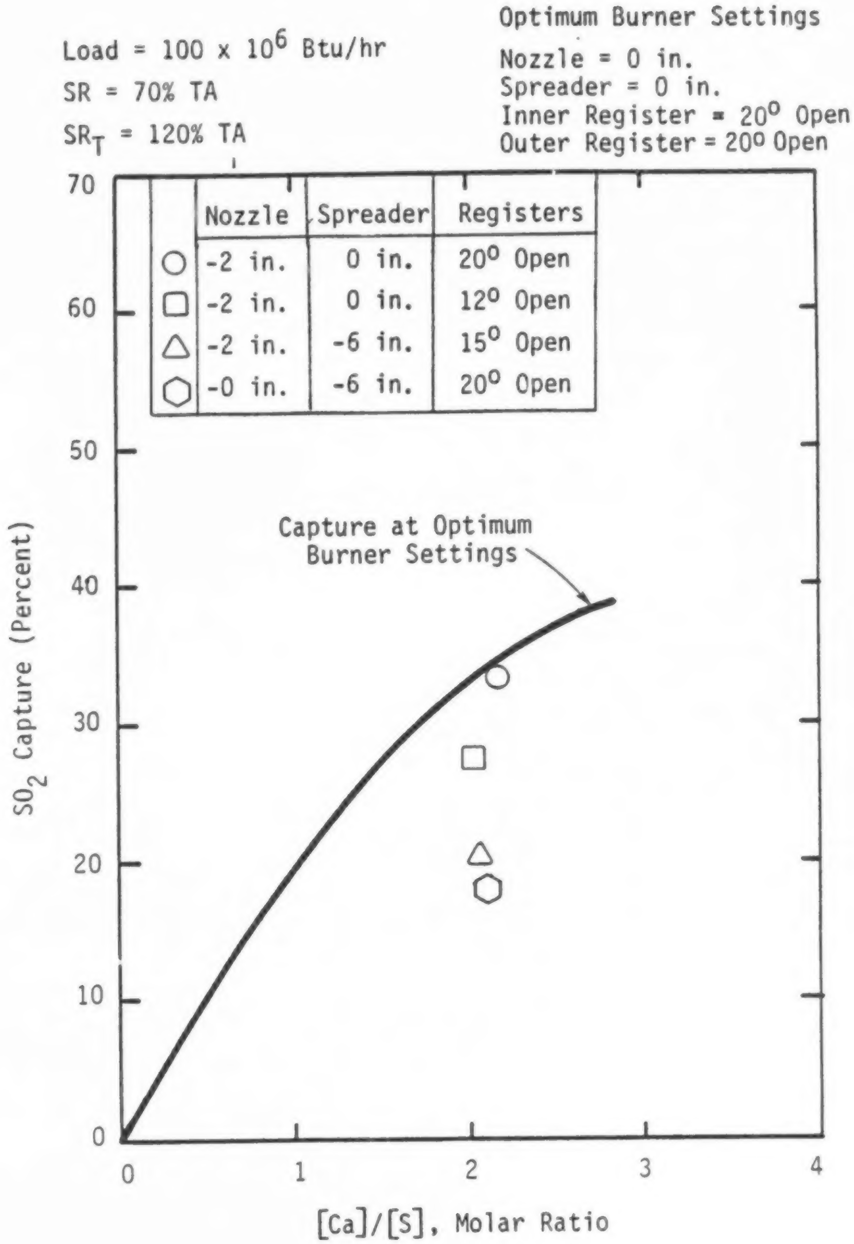


Figure 4-2. Effect of Burner Parameters on SO_2 Capture with Vicron Injected through Tertiary Air Ports while Firing Utah Coal.

TABLE 4-1. BURNER PERFORMANCE DURING PERTURBATIONS FOR SO_2 OPTIMIZATION

Test No.	Nozzle (in.)	Spreader (in.)	Inner Register (° Open)	Outer Register (° Open)	Firing Rate (10^6 Btu/hr)	SR_B (% TA)	SR_T (% TA)	$\frac{[Ca]}{[S]}$	Capture (%)	NO_x (ppm)	CO (ppm)	Observations
19.2b	0	0	20	20	100.5	70	121	0	0	203	22	Optimum Condition; flame 20-ft. long.
19.4a	0	-6	20	20	98.7	69	120	2.11	17.8	171	22	Flame impingement on rear wall.
19.4b	-2	0	20	20	97.1	71	124	2.14	33.8	234	21	Unstable; short flame 16-17 ft. long.
19.4c	-2	0	15	15	99.2	69	120	2.10	21.5	217	22	Stable; flame 21-ft. long.
19.4d	-2	0	12	12	100.1	68	118	2.08	28.1	224	23	Flame impingement on rear wall.

related to the unacceptable conditions of excessive flame length and reduced flame stability that resulted from exceeding the operating range of the RSC DMB.

Thermal environment is an important factor in the capture of sulfur species by sorbents. Residence time in the temperature regime necessary for sulfation predicates the degree of SO_2 reduction by the sorbent material. The effect of firing rate and its inherent effect on thermal environment was evaluated with sorbent injection at 60 percent of the RSC DMB capacity

The results are compared with full load tests, shown as solid lines in Figure 4-3. The level of capture achieved at low load, with the Vicron limestone material, was lower than capture at full load, for Ca/S less than 3, 27 percent versus 35 percent at Ca/S equal to 2. At Ca/S equal to 3, the capture at low load is comparable to that achieved at full load. The feeding rate necessary for Ca/S equal to 1 at low load was near the lower limit of the sorbent feeder operating range with the result that the feed rate was probably intermittent and actually lower than indicated. This may account for the very low capture at Ca/S equal to 1. At Ca/S equal to 2.0, there was no significant difference between injection locations for Vicron as in the case of the full load tests. The hydrated lime again achieved the highest capture, 48 percent at Ca/S equal to 2.0. For Ca/S greater than 1.6, the effectiveness of the hydrated lime decreased at low load.

4.1.2 Sorbent Injection with High Sulfur Fuels

Coal from Indiana has been used at EER as the base fuel for LIMB studies because of its medium range of sulfur content. Figure 4-4 summarizes the test results of sorbent injection with the RSC DMB firing Indiana coal. As with the Utah coal, the injection of hydrated lime yielded the highest levels of SO_2 capture, 54 percent at Ca/S equal to 2.0. There was no measurable effect of injection location on capture with Vicron as the sorbent. SO_2 capture with Vicron was approximately 35 percent at Ca/S equal to 2.0.

The Illinois coal tested represents a fuel used at an operating RSC boiler, CILCO Duck Creek Unit 1, that will be used to relate the LWS test results with field units. The sorbent feed system capacity was not sufficient to supply sorbent material to achieve calcium-to-sulfur molar ratios over 1.6 because of the high sulfur content, 3.97 percent, of the Illinois coal. Figure 4-5 presents the sulfur capture data over the limited range that could be achieved.

The hydrated lime was again the most effective sorbent. Injection of Vicron through the tertiary ports achieved slightly better capture than injection with the coal, although there was no difference at the highest Ca/S ratio that could be reached, 1.6. The differences between the two injection locations may not be

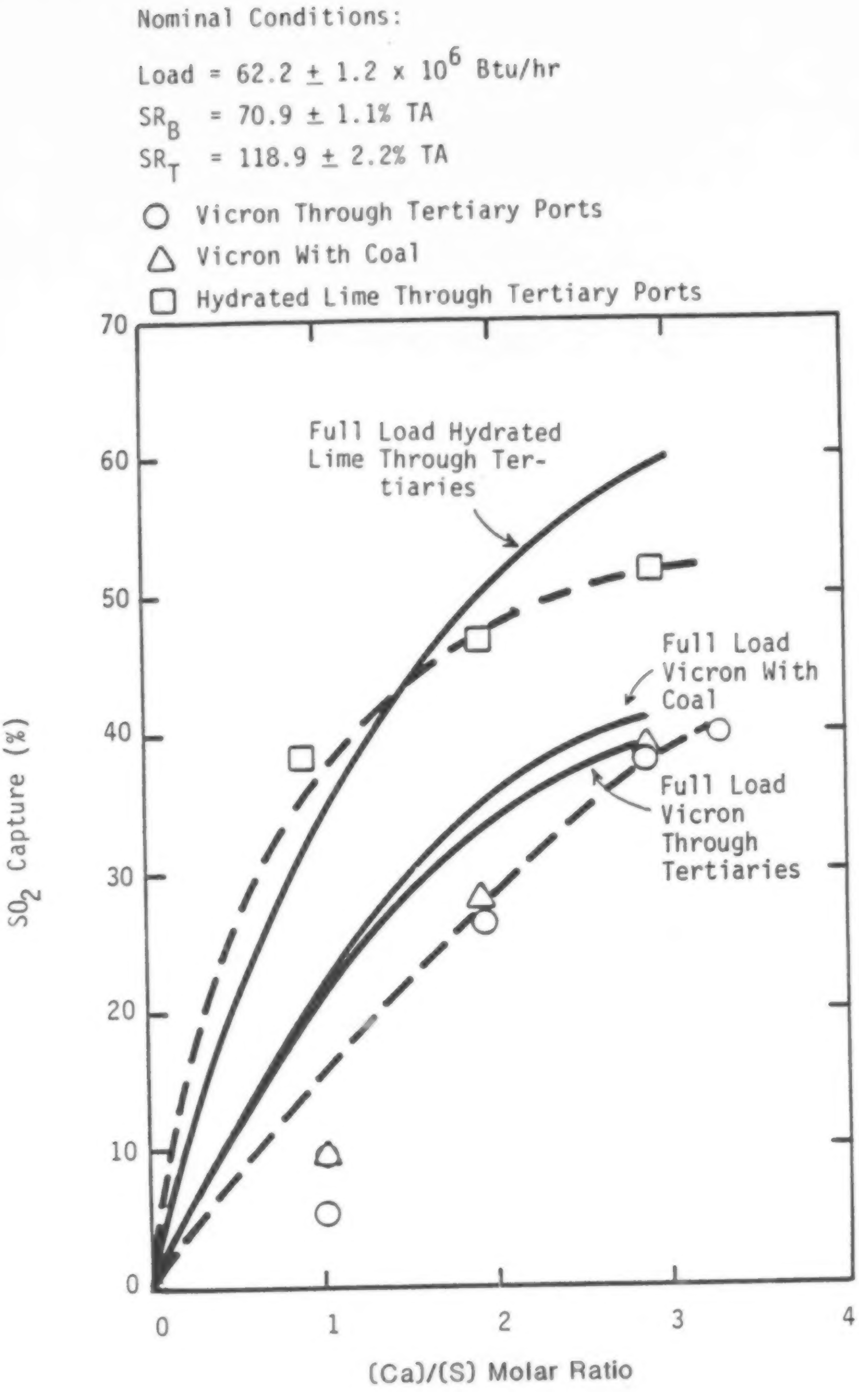


Figure 4-3. Effect of Load on SO_2 Capture Firing Utah Coal

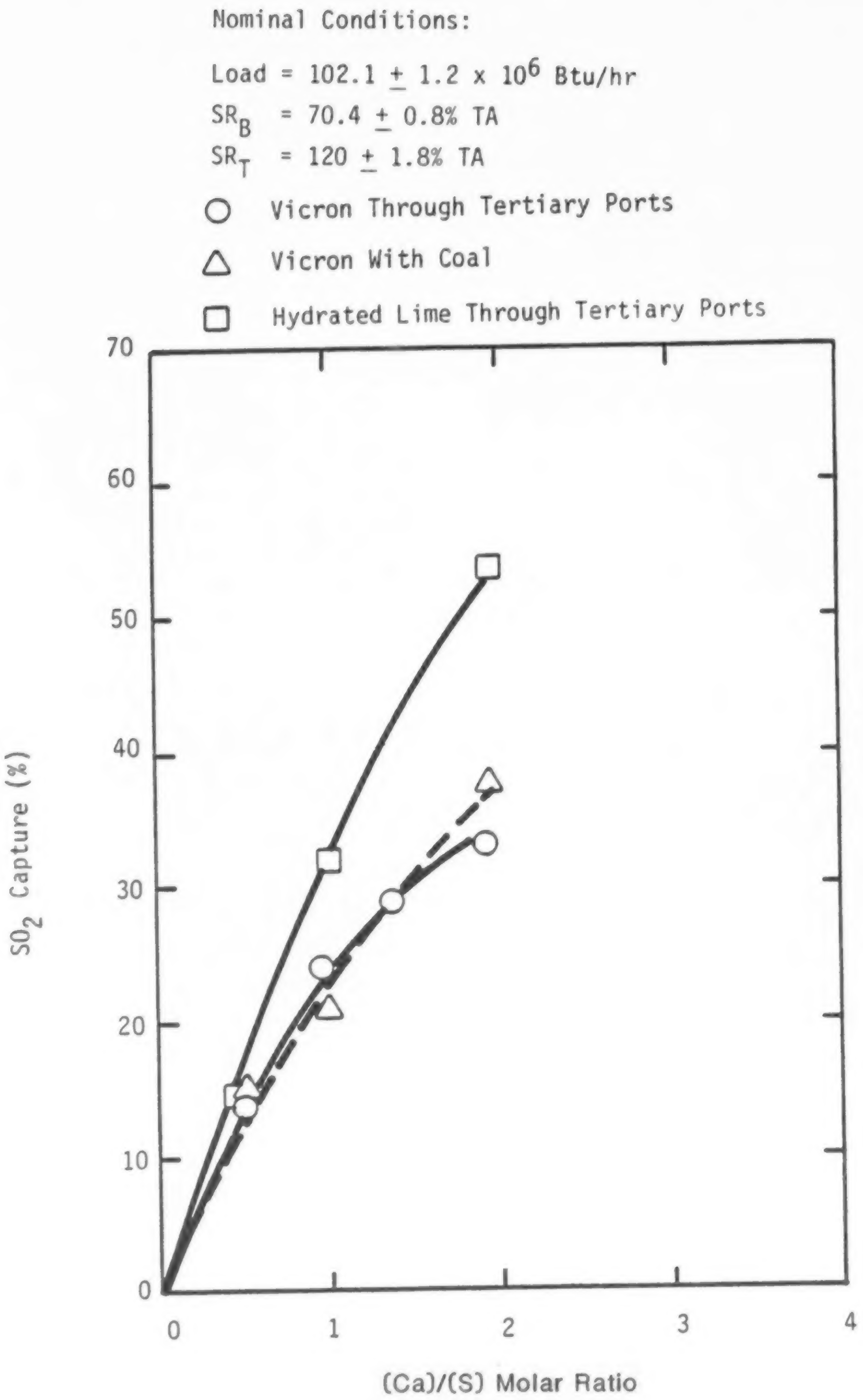


Figure 4-4. Summary of Sorbent Injection with Indiana Coal

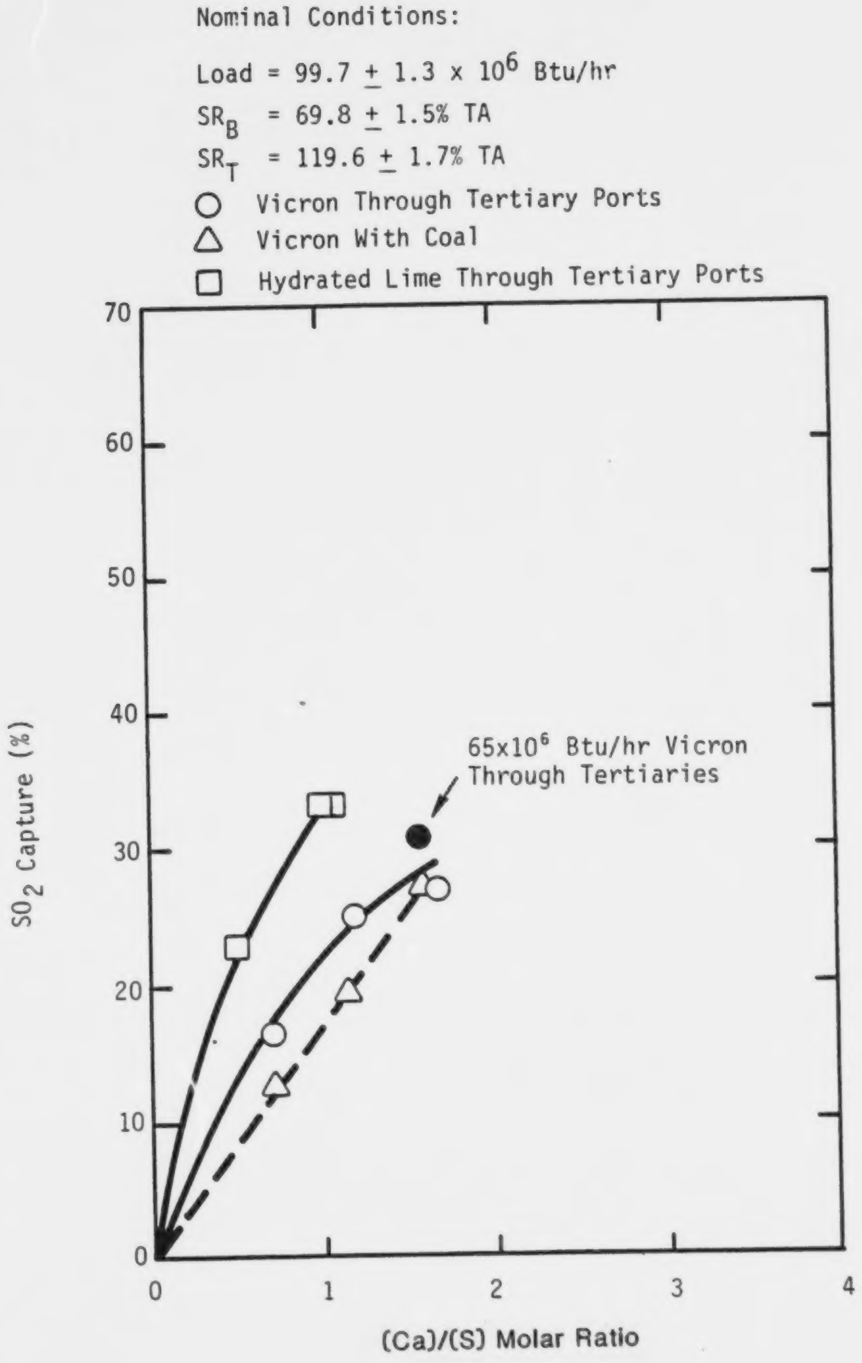


Figure 4-5. Summary of Sorbent Injection with Illinois Coal

significant. In a brief low load test at 65 x 10^6 Btu/hr, injection of limestone through the tertiary ports achieved about 31 percent capture at Ca/S equal to 1.55. This is comparable to the capture at full load, 28 percent at Ca/S equal to 1.6.

The trends for all three fuels were similar, with the best performance in terms of sulfur capture achieved by injecting hydrated lime through the tertiary air ports and with little difference in the effectiveness of injection locations with Vicron. Figure 4-6 presents the previously discussed data for Ca/S less than 4.0 on the basis of sorbent/injection location combinations to illustrate the effect of fuel composition.

Intuitively, an effect of composition, sulfur content in particular, would be anticipated. The sulfation reaction would be thought to be driven in part by the concentration of sulfur species. The SO_2 capture data presented shows no discernible effect of coal composition for the RSC DMB system.

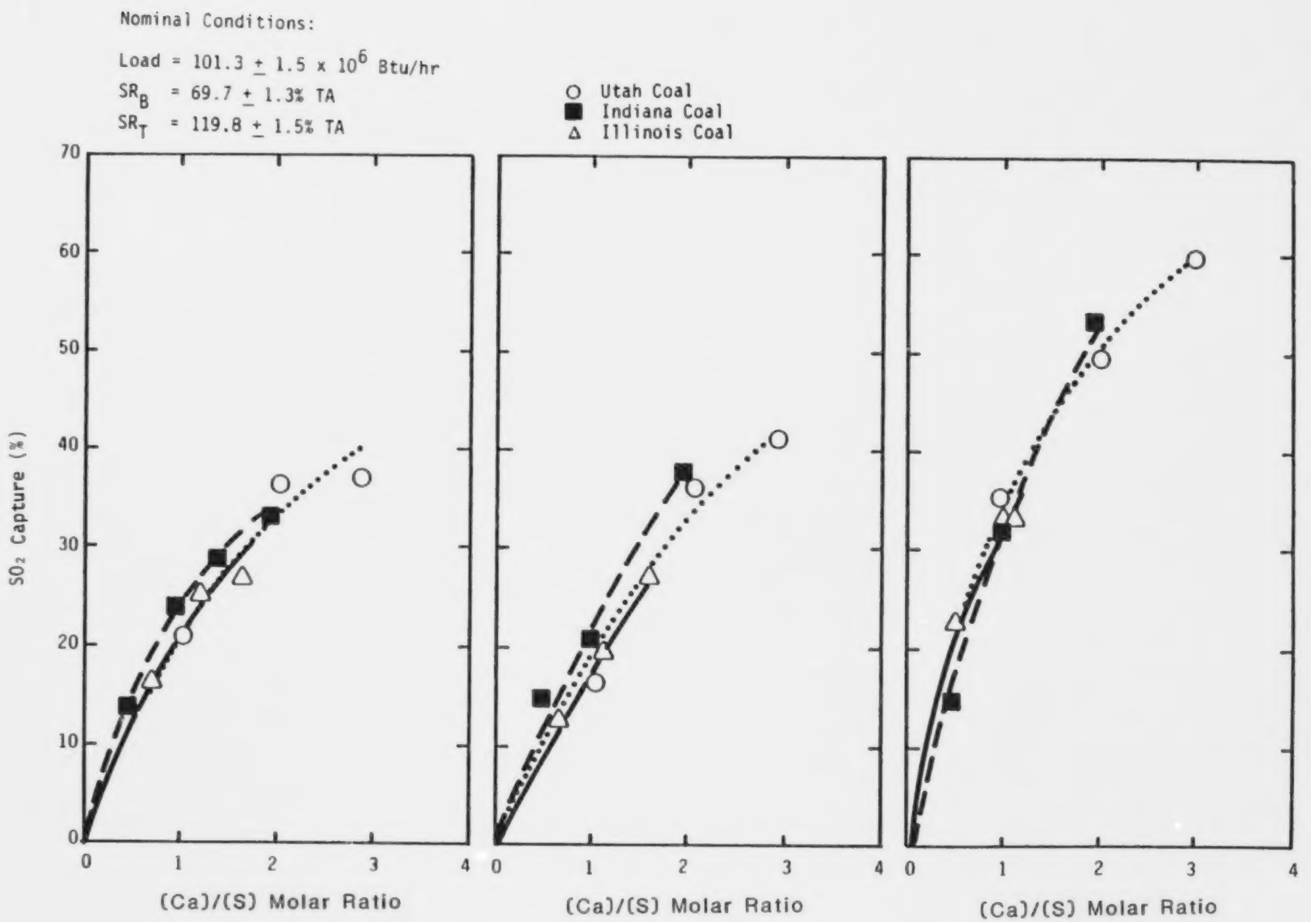
4.1.3 Aerodynamics of Sorbent Injection

Based on general interest, a brief series of tests were conducted with variable sorbent injection velocity. This was achieved by varying the amount of transport air used in the sorbent injection pipes, which were located on the axis of each of the four tertiary air ports. The first series of tests utilized the optimum RSC DMB configuration with the high velocity, 8-in. diameter tertiary air ports. The sorbent injection velocity was considered relative to the tertiary velocity with a dimensionless ratio, defined as:

$$\lambda = \frac{\nu_{\text{tertiary}}}{\nu_{\text{injection}}}$$

Figure 4-7(a) shows the results of the preliminary tests. For constant tertiary velocity, decreasing the sorbent injection velocity resulted in a reduction in SO_2 capture. High sorbent injection velocities were necessary to achieve λ less than 1 with the small tertiary ports. To evaluate the low range of this relative velocity parameter, the small tertiary inserts were removed leaving 12-in. diameter tertiary ports. Because of flame length considerations, the RSC DMB was operated at a burner zone stoichiometry of only 80 percent TA rather than at its design point of 70 percent TA. These conditions yielded tertiary velocities of about 72 ft/sec. The results from these tests are presented in Figure 4-7(b). For this particular arrangement, a reduction in sorbent injection velocity resulted in a significant decrease in SO_2 capture.

During the sorbent injection tests preceding this investigation of sorbent injection velocity, constant sorbent air flow was maintained to the extent possible. High sorbent feed rates generally resulted in increased resistance to the air flow, thus some variation



(a) Vicron Through Tertiary Ports

(b) Vicron With Coal

(c) Hydrated Lime Through Tertiary Ports

Figure 4-6. Effect of Coal Composition on SO_2 Capture

in transport flow and velocity was experienced. Table 4-2 summarizes the sorbent velocity ratios for these tests. The majority of the full load tests with spreader #5 were conducted with the injection velocity matching the tertiary velocity λ equal to 1.

TABLE 4-2. SORBENT VELOCITY RATIOS USED IN RSC DMB SORBENT INJECTION TESTS

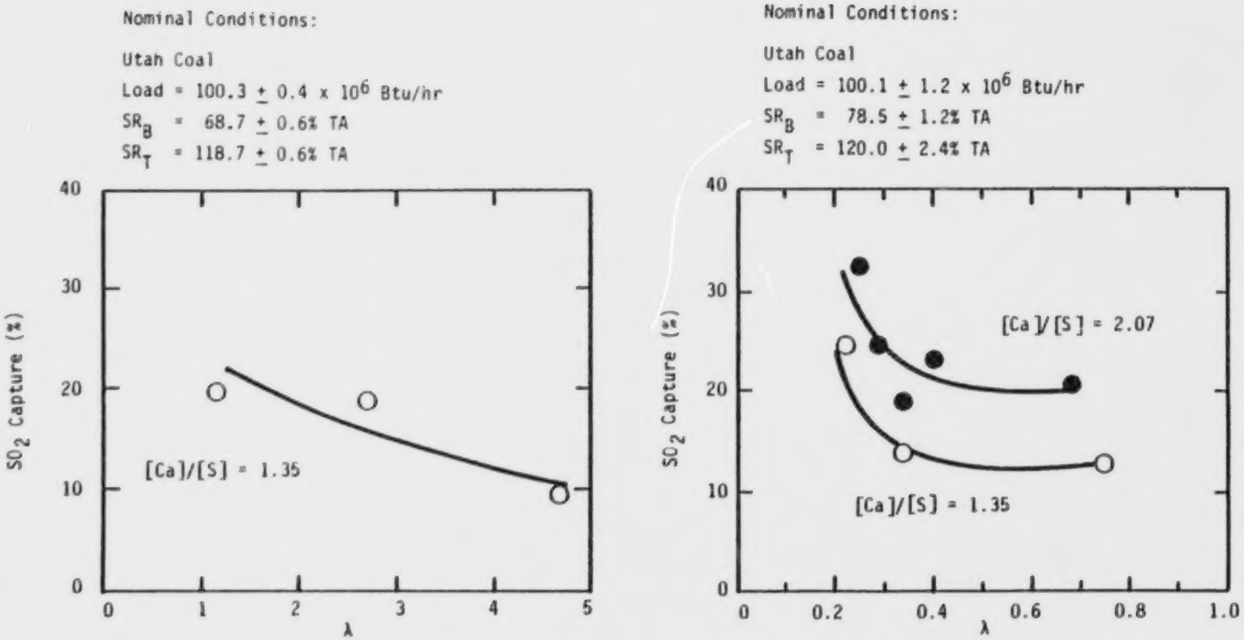
Coal	Firing Rate (10^6 Btu/hr)	Design	$\lambda = \frac{\nu_{tertiary}}{\nu_{injection}}$	
			Mean	Std. Dev.
Utah	100	#2	1.5	0.2
Utah	100	#5	1.1	0.2
Utah	60	#5	0.7	0.2
Indiana	100	#5	1.0	0.3
Illinois	100	#5	0.8	0.2

The low load tests with Utah coal used similar sorbent air flow and velocity as in the full-load tests to ensure adequate air flow for transporting the sorbent material, however, tertiary velocities were lower because of the decreased air flow required to maintain design point excess air and burner zone stoichiometry. The result of this combination was a velocity ratio less than unity. Although there were differences in sorbent velocities and for the various test conditions, the data in Figure 4-7 imply that there is little effect on SO_2 capture by in the range of 0.7 to 1.5.

4.2 SULFUR CAPTURE POTENTIAL WITH RSC COMMERCIAL BURNERS

4.2.1 Sorbent Injection Tests with Utah Coal

The potential for SO_2 reduction with the CCV and Flare burners was evaluated for each spreader nozzle configuration at unstaged conditions. The sorbent material, Vicron, or dolomite, was injected into the coal/primary air stream at the outlet of the mill exhauster. Hydrated lime was not used for these unstaged tests with injection into the coal stream since tests with the RSC DMB had shown that SO_2 capture for this combination was very low. The results of the tests with the unstaged Flare and CCV burners are summarized in



(a) 8-in. Teritary Ports (205 ft/sec)

(b) 12-in. Teritary Ports (72 ft/sec)

Figure 4-7. Effect of Injection Velocity on SO_2 Capture with Vicron

Figure 4-8. Highest sulfur capture was achieved using the CCV burner equipped with spreader #5L, with 35 percent removal at Ca/S equal to 2.0. The other two CCV spreaders, the baseline cone and #5, yielded captures of 26 and 22 percent, respectively, at Ca/S of 2. SO_2 reduction with the Flare nozzle was comparable to that achieved by the CCV burner with the conical spreader.

The higher capture achieved by the CCV equipped with spreader #5L may be related to a number of factors, including the flame aerodynamics generated by the coal spreader and problems experienced maintaining stable coal transport. Problems with coal transport were caused by the relatively high pressure drop across the spreader with the injection of the additional material into the primary air stream further increasing the resistance to flow. The net effect was a drop in firing rate from 100 x 10^6 to 91 x 10^6 Btu/hr, probably resulting in slightly lower bulk furnace temperatures.

The effect of staging on sulfur capture was evaluated with the 100 x 10^6 Btu/hr CCV burner equipped with spreader #5L. Test results for progressively staged conditions are shown in Figure 4-9. Differences in capture between unstaged and staged conditions are small. At Ca/S equal to 2, SO_2 reduction ranged from 35 percent for unstaged operation to 38 and 36 percent at burner zone stoichiometries of 90 and 70 percent TA, respectively.

The effect of injection location under staged conditions with the 100 x 10^6 Btu/hr CCV burner is shown Figure 4-10. Injection of Vicron through the tertiary air ports achieved slightly higher capture, 40 percent at Ca/S equal to 2, than when injected with the coal, 36 percent.

The effect of sorbent type on SO_2 reduction from Utah coal with the CCV burner is shown in Figure 4-11. The test results are shown for staged conditions with sorbent injected through the tertiary air ports and unstaged conditions with sorbent injected into the coal stream. Dolomite injected through the tertiary air ports achieved the highest capture with 46 percent reduction at Ca/S of 2. Vicron limestone and hydrated lime achieved similar capture of 40 percent. For Ca/S greater than 2, however, the advantage of the dolomite increases significantly.

At unstaged conditions for the CCV burner equipped with the conical spreader, dolomite achieved higher capture, 37 percent at Ca/S equal to 2, than the Vicron limestone, 26 percent, when both are injected into the coal stream. Overall these tests indicate that the dolomite is the best sorbent for comparable calcium-to-sulfur molar ratios than either limestone or hydrated lime. However, approximately 60 percent more dolomite by weight is required to achieve comparable calcium-to-sulfur ratios. This would have to be considered in terms of additional material handling requirements for practical

Nominal Conditions:

Fuel--Utah

Sorbent/Location = Vicron/Mill

	Burner	Spreader	Firing Rate (x 10^6 Btu/hr)
○	CCV	BL Cone	100.7 ± 1.62
□	CCV	#5	97.7 ± 1.87
△	CCV	#5L	91.2 ± 1.68
◗	Flare	Flare	99.9 ± 3.2

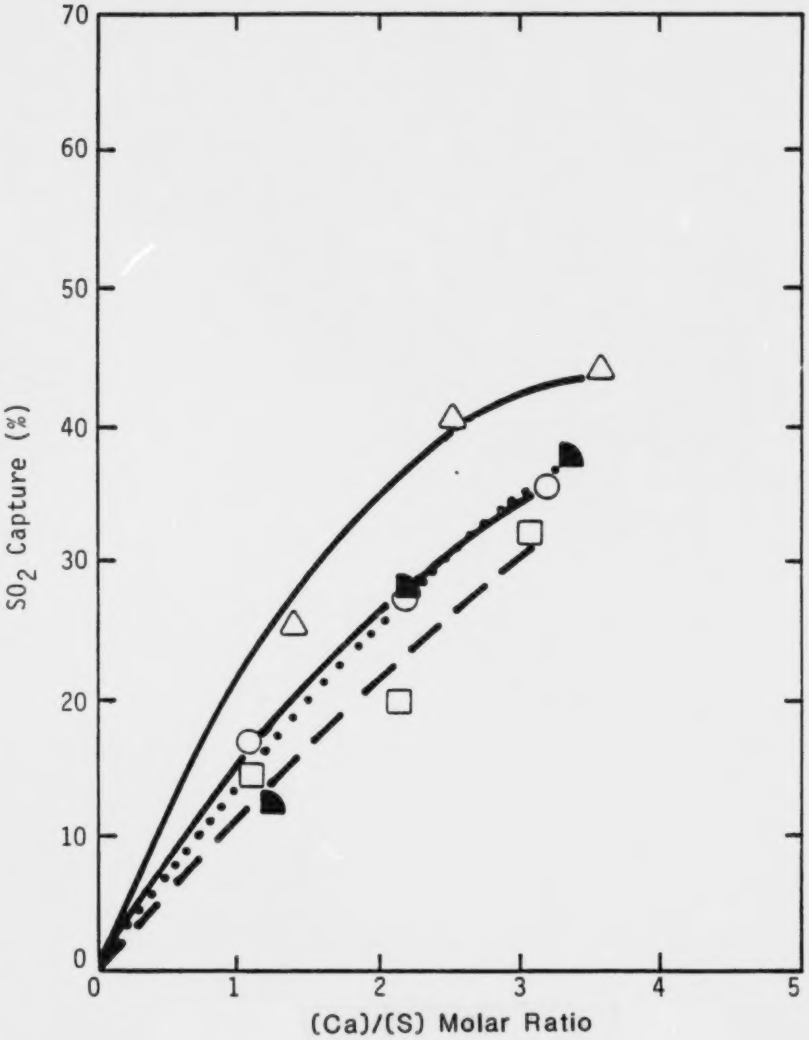


Figure 4-8. Effect of Spreader Design on SO_2 Capture with 100 x 10^6 Btu/hr RSC Commercial Burners Under Unstaged Conditions

Nominal Conditions:

Fuel--Utah

Sorbent = Vicron Location-Mill

	SR_B (% TA)	Firing Rate (x 100 Btu/hr)
○	70.0	101.5 ± 0.59
●	89.0	97.8 ± 1.13
△	Unstaged	91.2 + 1.68

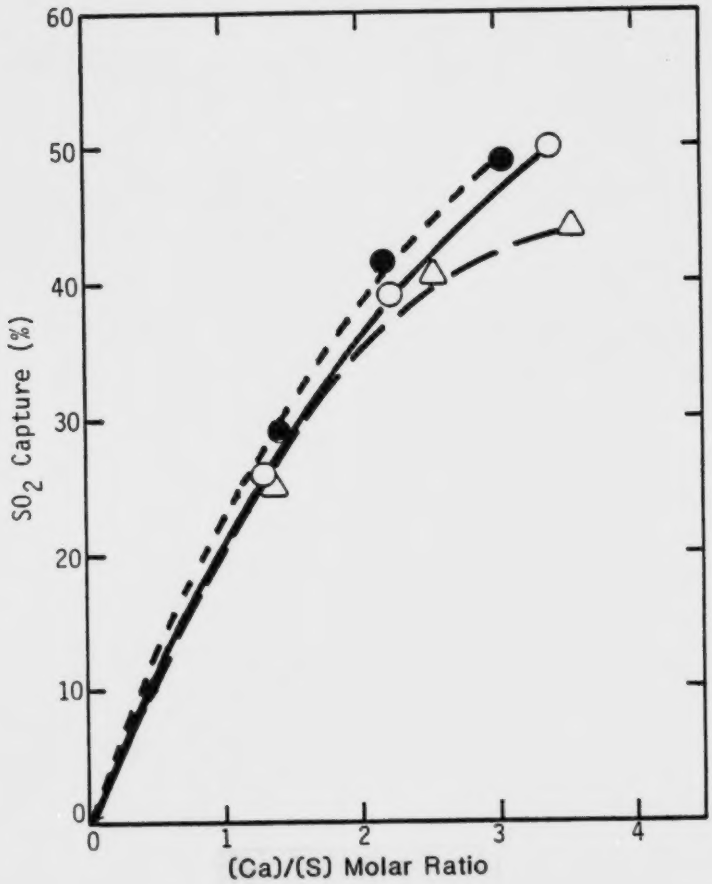


Figure 4-9. Effect of Staging on SO_2 Capture with the CCV Burner Equipped with Spreader #5L

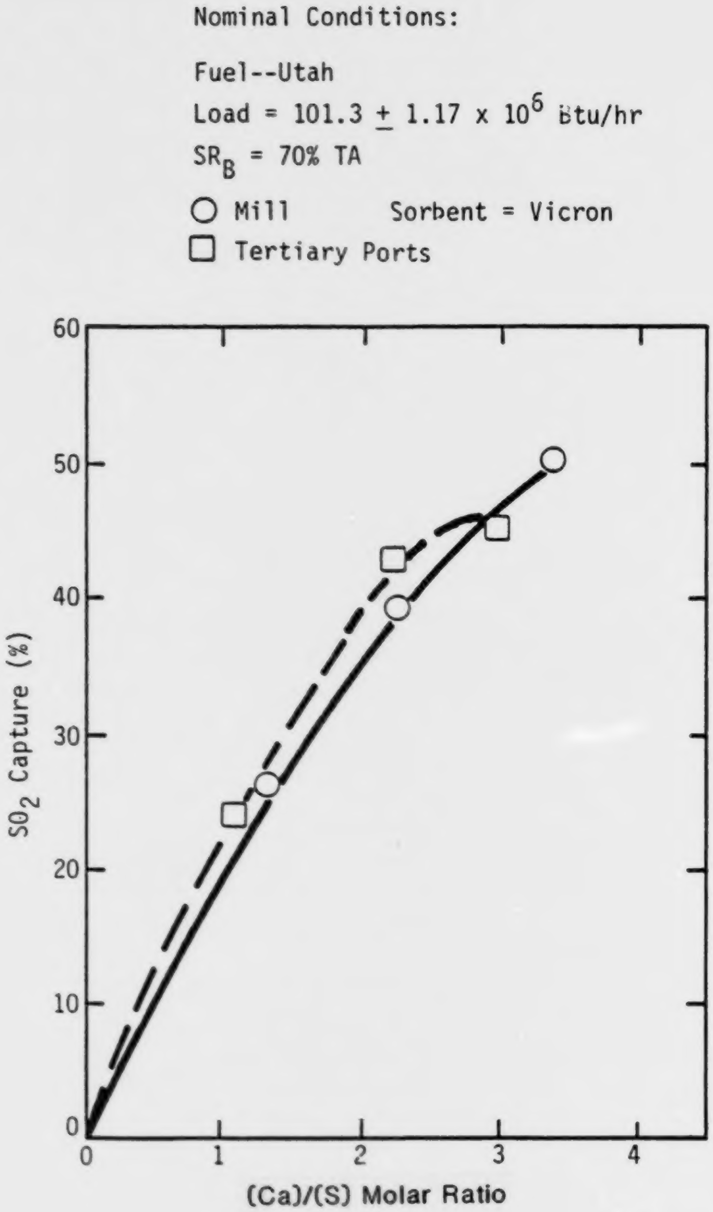
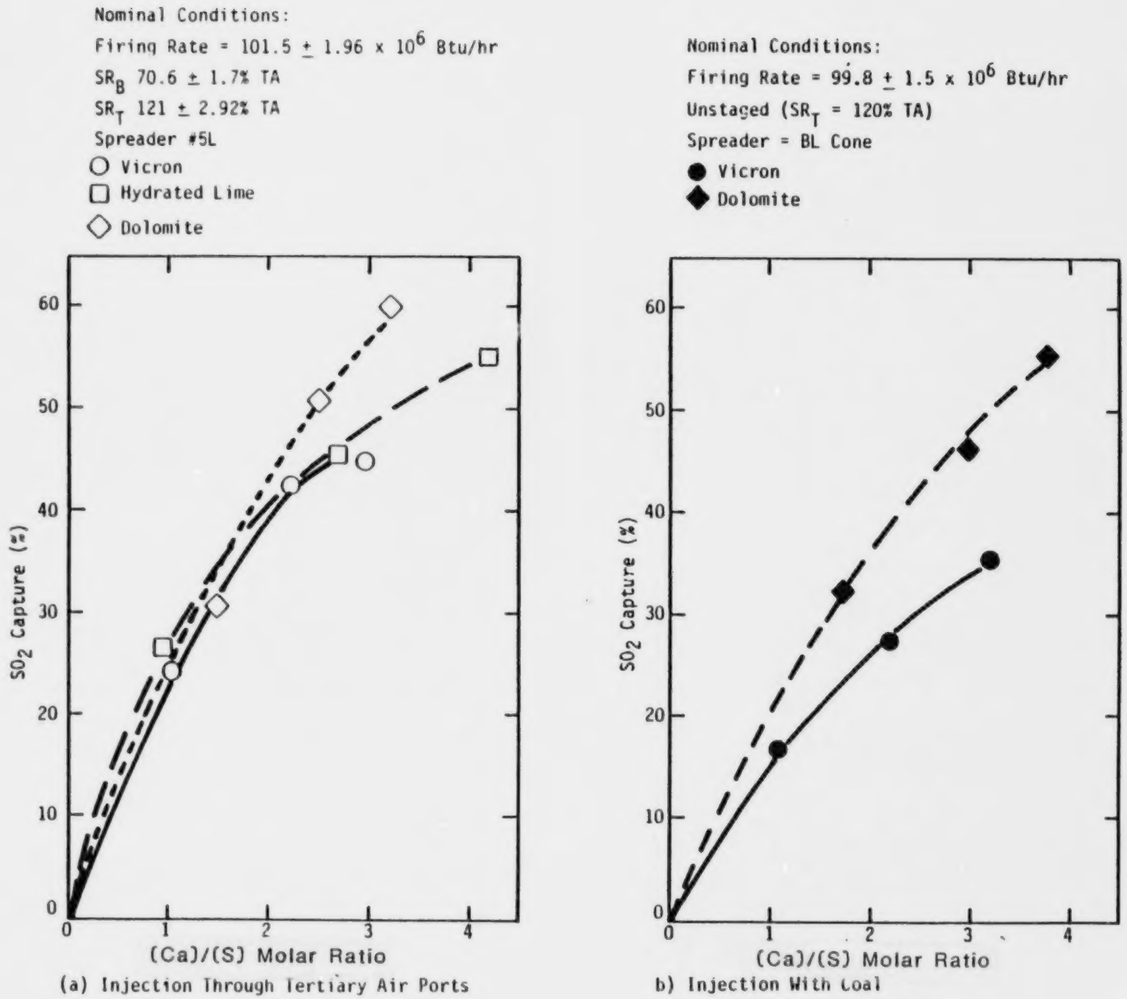


Figure 4-10. Effect of Injection Location on SO_2 Capture with the CCV Burner Equipped with Spreader #5L Under Staged Conditions



(a) Injection Through Tertiary Air Ports

b) Injection With Coal

Figure 4-11. Effect of Sorbent on SO_2 Capture with the CCV Burner Firing Utah Coal

Thermal environment is an important factor in the capture of sulfur species by sorbents as discussed previously. Figure 4-12 summarizes the effect of firing rate and the corresponding thermal environment on SO_2 capture with the 100 x 10^6 Btu/hr CCV burner under unstaged conditions. Decreasing load to 57.5 x 10^6 Btu/hr resulted in an increase in SO_2 capture from 26 percent to 38 percent at Ca/S equal to 2.0 with Vicron injected into the coal stream.

4.2.2 SO_2 Reduction with Illinois Coal

A brief series of tests was conducted to evaluate the effect of sorbent injection using a high sulfur Illinois coal. In addition, Illinois represents a fuel used at an operating boiler, CILCO Duck Creek Unit 1, and may provide an indication of sulfur capture potential at a field unit. The sorbent feed system capacity was not sufficient to supply sorbent material to achieve calcium-to-sulfur molar ratios over 2.2 at full load for the high sulfur content fuel, 2.45-2.91 percent. Figure 4-13 summarizes the sulfur capture data with Illinois coal. The capture achieved for the 100 x 10^6 Flare and CCV burners with the conical spreader was similar, with 30 and 32 percent removal, respectively, at Ca/S equal to 2.0.

The effect of thermal environment as determined by load is also shown in Figure 4-13 for unstaged operation. Reducing firing rate to 58 percent capacity increased SO_2 capture by approximately 8 percent to 38 percent at Ca/S equal to 2.0. Sorbent was also injected with the scaled-down 50 x 10^6 Btu/hr CCV burner, resulting in a 5 percent higher capture than the 100 x 10^6 Btu/hr CCV at 50 percent capacity. At Ca/S less than 2.0, the capture for both 50 x 10^6Btu/hr load configurations are generally the same. At higher sorbent feed rates, Ca/S greater than 2, the flame with the 50 x 10^6 Btu/hr CCV became quite unstable.

It was not possible to operate the burner at that condition for a normal test period, which may have biased results toward higher capture at the high sorbent feed rate. In this case, the remaining data indicates that sorbent injection with both reduced firing rate configurations results in similar SO_2 capture under unstaged conditions.

For the CCV burner, the increase in sulfur capture as a result of reducing load is probably due to thermal effects rather than specific design parameters which could affect the burner aerodynamics. The increased SO_2 capture at unstaged reduced loads with the Illinois coal is similar to the results found with Utah coal, which indicates comparable flame temperature and sorbent interaction.

Figure 4-14 illustrates the effect of fuel composition for two burner configurations, the 100 x 10^6 Btu/hr Flare and CCV burners. Intuitively, an effect of fuel composition, sulfur content in

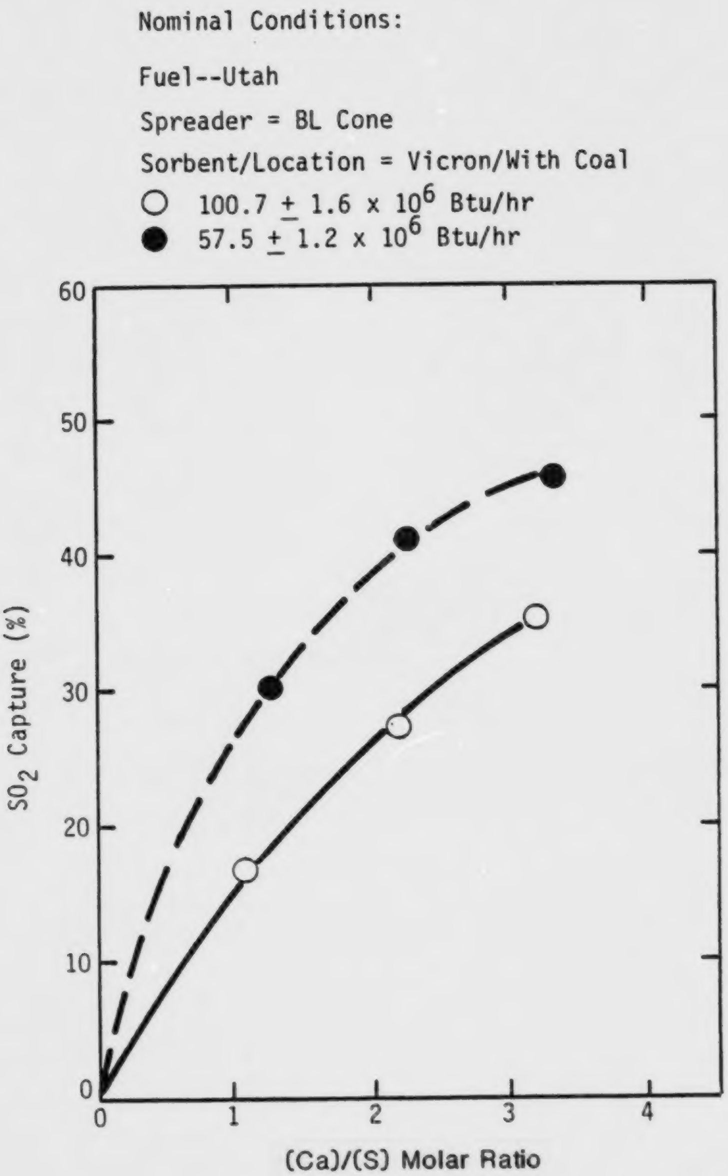


Figure 4-12. Effect of Load on SO_2 Capture with the CCV Burner Under Unstaged Conditions

Nominal Conditions:

Fuel--Illinois

Unstaged Operation $SR_T = 121.6 \pm 3.4\%$ TA

Sorbent--Vicron

Location--With Coal

	Burner	Spreader Design	Firing Rate (10^6 Btu/hr)
○	Flare 100	Flare	98.2 ± 3.1
□	CCV 100	BL Cone	98.6 ± 1.4
◨	CCV 100	BL Cone	58.0 ± 1.4
■	CCV 50	BL Cone	49.5 + 3.2

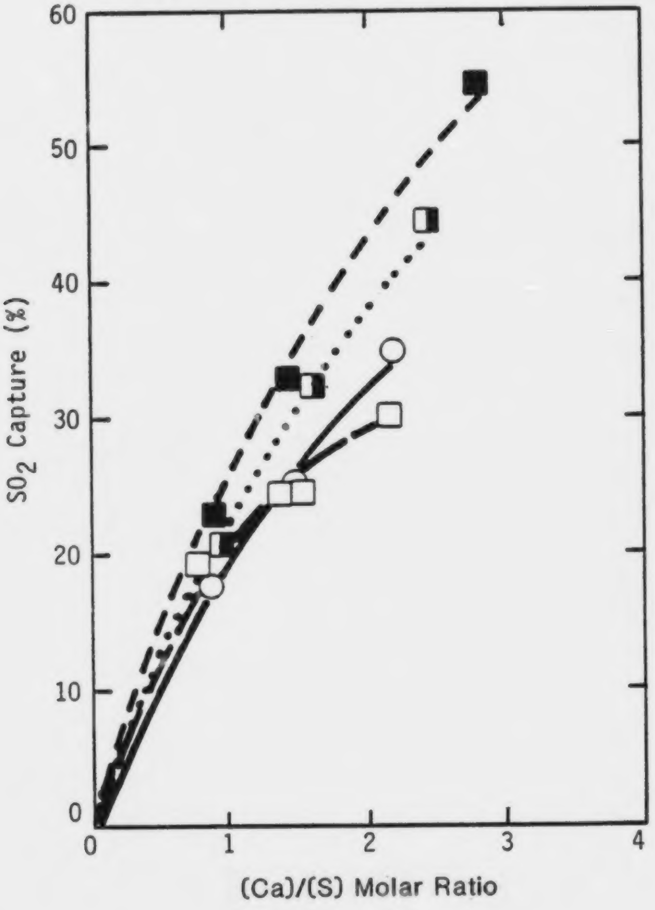
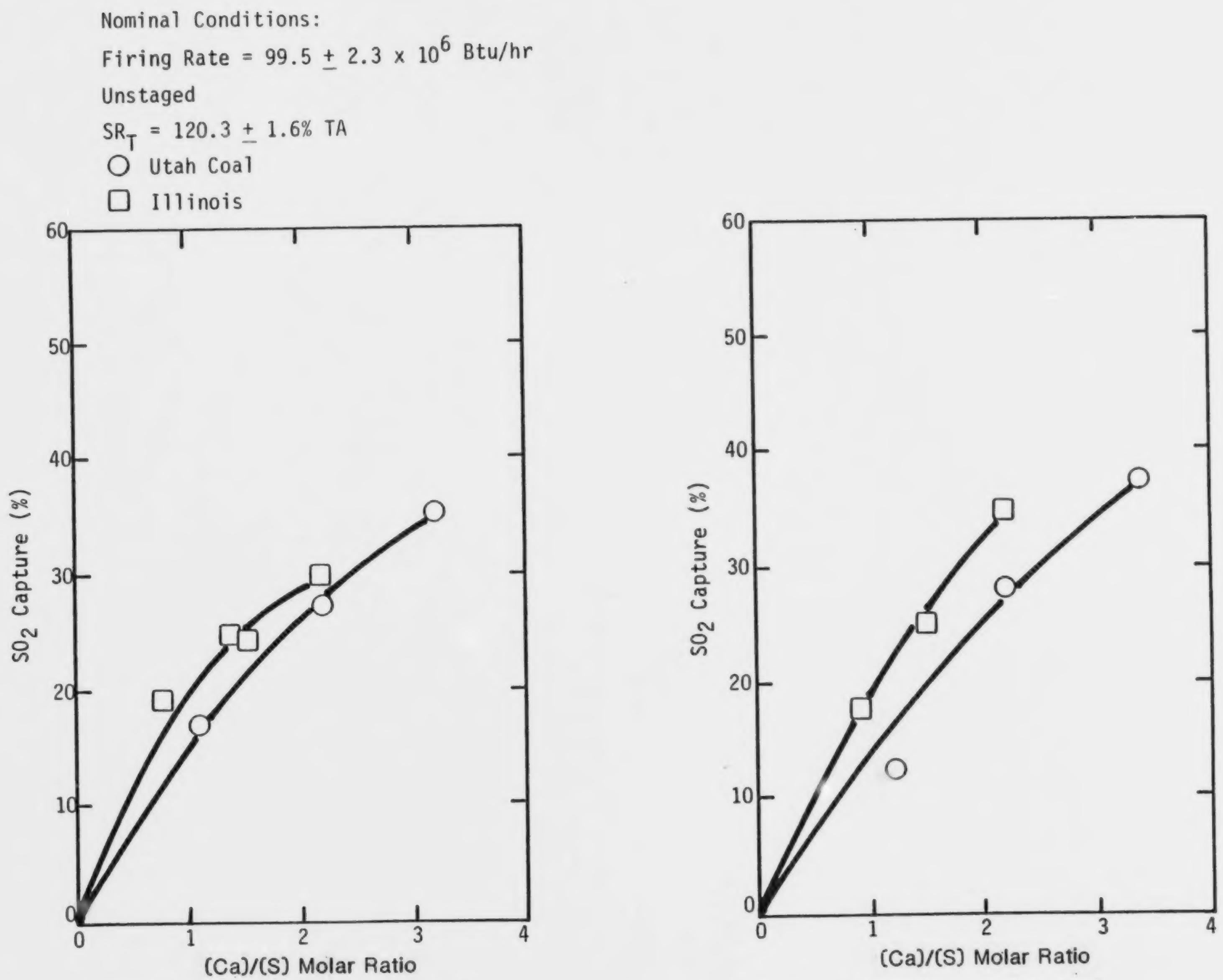


Figure 4-13. Summary of SO_2 Reduction Potential of RSC Commercial Burners Firing Illinois Coal



a) CCV 100/BL Cone--Vicron With Coal

b) Flare 100--Vicron With Coal

Figure 4-14. Effect of Coal Composition on SO_2 Capture with Unstaged RSC Commercial Burners

particular, would be expected. The sulfation reaction would be thought to be driven in part by the concentration of sulfur species in the fuel. With both configurations tested, SO_2 capture increased slightly with the higher sulfur Illinois coal. The greatest increase observed was about 7 percent with the Flare burner.

4.3 EFFECT OF BURNER DESIGN SO_2 REDUCTION POTENTIAL

4.3.1 RSC Burners

The effect of burner design on SO_2 reduction potential can be evaluated by comparing results of each burner design with the same sorbent/injection location combination. Figure 4-15 summarizes the result of injecting Vicron into the coal stream for each of the RSC burners at the corresponding optimum conditions for each burner. Any difference in SO_2 reduction between these burners indicate possible burner design effects since the same sorbent, injection location, firing rate, and fuel were used for each. There is no significant difference between the 100 x 10^6 Btu/hr CCV burner, either staged or unstaged, and the RSC DMB with SO_2 reduction of about 35 percent at Ca/S equal to 2.0. The 100 x 10^6 Btu/hr Flare burner achieved significantly less capture, 26 percent at Ca/S equal to 2.0.

Figure 4-16 compares the SO_2 reduction potential for the 100 x 10^6 Btu/hr CCV burner and RSC DMB at nominal staged conditions for three sorbent injection location combinations. There is generally no discernible difference for either burner using Vicron with the coal. Injection location appears to have little effect with Vicron. SO_2 capture was about 2 percent higher at Ca/S equal to 2 when Vicron was injected through the tertiary air ports. Only at higher sorbent feed rate does the burner seem to have an effect. Injection of hydrated lime through the tertiary air ports produced the greatest difference in SO_2 reduction between the two burners. At Ca/S equal to 2.0, SO_2 capture was 49 percent with the DMB compared to 40 percent with the CCV burner.

The reactivity of a given sorbent is strongly dependent on the temperature history and peak temperature seen by the sorbent particles. Sulfation is determined by the amount of time available in the most favorable temperature regime of approximately 2250-1600°F(4). Above 2250°F sorbents tend to deadburn and SO_2 adsorption is limited by chemical equilibrium. Below 1600°F SO_2 adsorption is too slow to be significant. The effects of thermal history were investigated by reducing the heat input to the furnace.

Sorbent injection tests were conducted at reduced furnace load with three design configurations: 1) DMB with Utah coal, Illinois coal, 2) 100 x 10^6 Btu/hr CCV burner with the cone spreader and Utah coal, and 3) 50 x 10^6 Btu/hr CCV burner with the cone spreader and Illinois coal. In the DMB tests, reducing thermal load produced

Nominal Conditions:

Fuel--Utah

Sorbent = Vicron

Injection Location = Mill (With Coal)

	Burner	Spreader Design	SR_B (% TA)	SR_T (% TA)	Firing Rate (10^6 Btu/hr)
○	CCV 100	#5L	69.7 ± 0.6	121.7 ± 0.6	101.5 ± 0.6
□	DMB	#5	69.7 ± 0.6	120.7 ± 0.6	101.5 ± 0.3
●	CCV 100	#5L	125.0 ± 2.6	125.0 ± 2.6	91.2 ± 1.7
△	Flare 100	Flare	121.7 ± 2.1	121.7 ± 2.1	99.9 ± 3.2

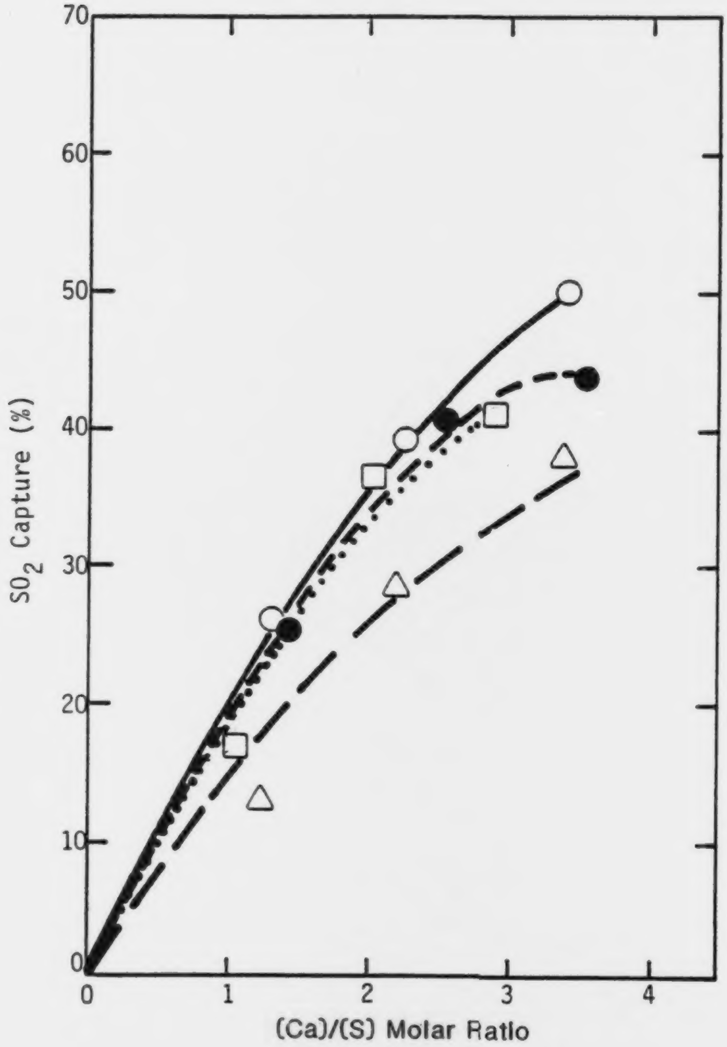


Figure 4-15. Effect of Burner Design on SO_2 Reduction Potential

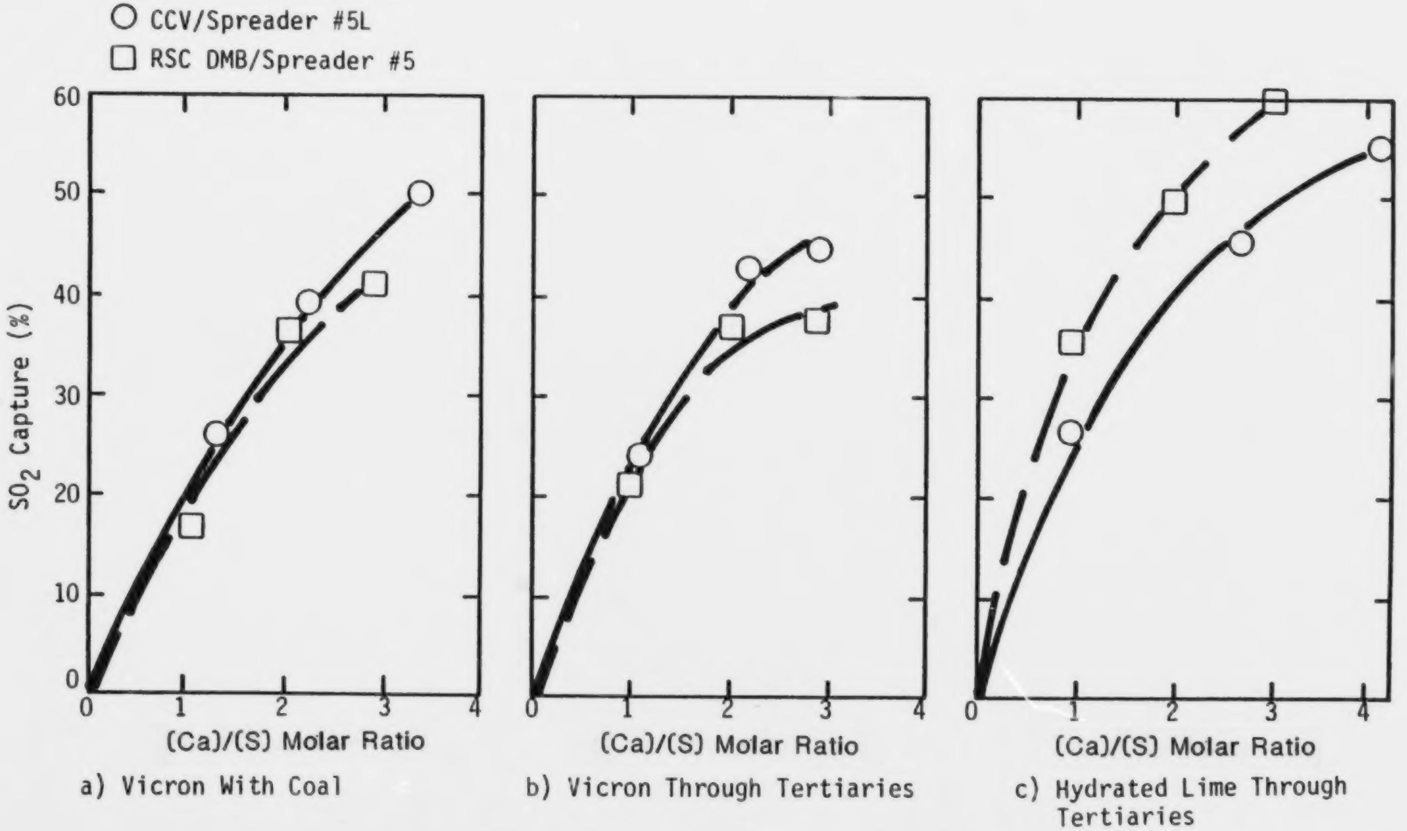
Nominal Design Conditions:

Fuel--Utah

Firing Rate = 101.6 ± 1.19 x 10^6 Btu/hr

SR_B 69.6 ± 1.65% TA

SR_T = 120.6 = 1.98% TA



a) Vicron With Coal

b) Vicron Through Tertiaries

c) Hydrated Lime Through Tertiaries

Figure 4-16. Comparison of SO_2 Reduction with 100 x 10^6 Btu/hr CCV Burner and RSC DMB

little effect on SO_2 capture regardless of injection location as shown earlier in Figure 4-3. During the low load CCV burner tests sorbent was injected through the coal nozzle. SO_2 capture increased significantly for 100 x 10^6 Btu/hr CCV burner at part load tests, Figure 4-12, and the 50 x 10^6 Btu/hr CCV burner tests, Figure 4-13.

While there is not enough information available to make projections of field performance, two general observations can be made. When sorbent was injected into the DMB flame, SO_2 capture was independent of furnace thermal environment. However, when sorbent is injected into the more intense unstaged CCV burner flame, SO_2 capture was dependent on furnace thermal environment.

4.3.2 SO_2 Reduction With Low-NO_x Burners Tested in the LWS

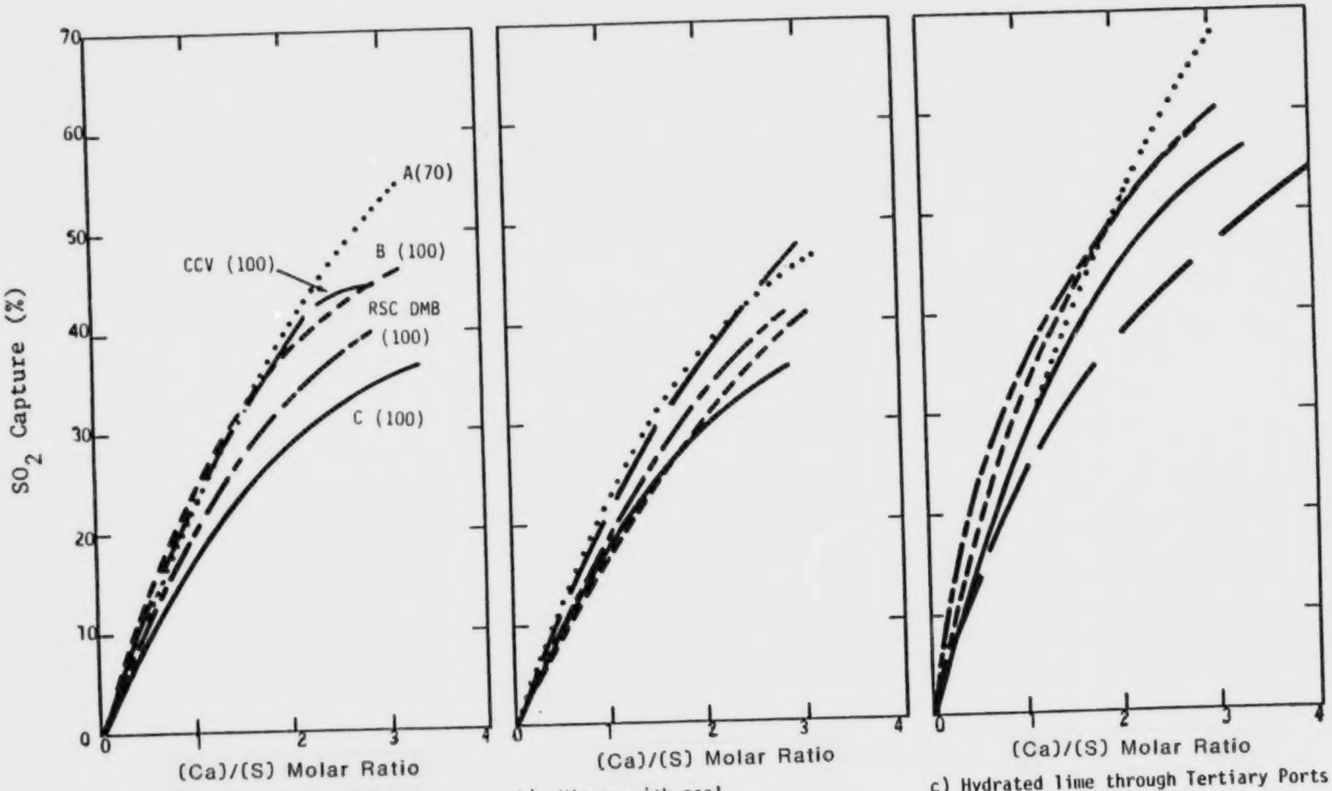
The sulfur reduction potential of the 100 x 10^6 Btu/hr RSC DMB and CCV burners are compared to captures achieved by three other low-NO_x burners tested in the LWS with Utah and Indiana coals in Figure 4-17 and 4-18, respectively. The SO_2 test results shown were obtained at optimum full load design point conditions for each burner. Burner A had a nominal firing rate of 70 x 10^6 Btu/hr while the other burners were fired at 100 x 10^6 Btu/hr.

The highest overall SO_2 capture was achieved with burner A for both coals and each sorbent/injection location pair. The lower firing rate probably contributes to a less intense flame zone. Although reduced firing rate had little effect of SO_2 reduction with the RSC DMB, the scaled-down 50 x 10^6 Btu/hr CCV burner achieved higher SO_2 removal compared to the 100 x 10^6 Btu/hr CCV. These differences probably contribute to the observed trends of increased SO_2 capture with the 70 x 10^6 Btu/hr burner.

For the Utah coal using Vicron injected both through the tertiary air ports and with the coal, sulfur capture was highest for the CCV burner compared to the other 100 x 10^6 Btu/hr burners, 37 percent at Ca/S equal to 2.0. This level of reduction is similar to that achieved by the 70 x 10^6 Btu/hr burner A. SO_2 capture for the RSC DMB was 33 percent, lower than for the CCV burner for both injection locations. The lowest capture was achieved by burner C with 29 percent at Ca/S equal to 2.0 for each case. Burner B achieved similar capture to the CCV for Vicron through the tertiary air ports, but was considerably lower, 30 percent, for Vicron injection with the coal.

Sulfur capture with hydrated lime was higher than with Vicron for all the burners. The RSC DMB and burner B resulted in the highest capture, 49 percent at Ca/S equal to 2.0 which is comparable to that for the 70 x 10^6 Btu/hr burner A. The lowest SO_2 removal, 40 percent, was achieved by the 100 x 10^6 Btu/hr CCV.

Nominal Conditions:
Full load
Optimum design point conditions
Note: Firing Rate in ( ) x 10^6 Btu/hr



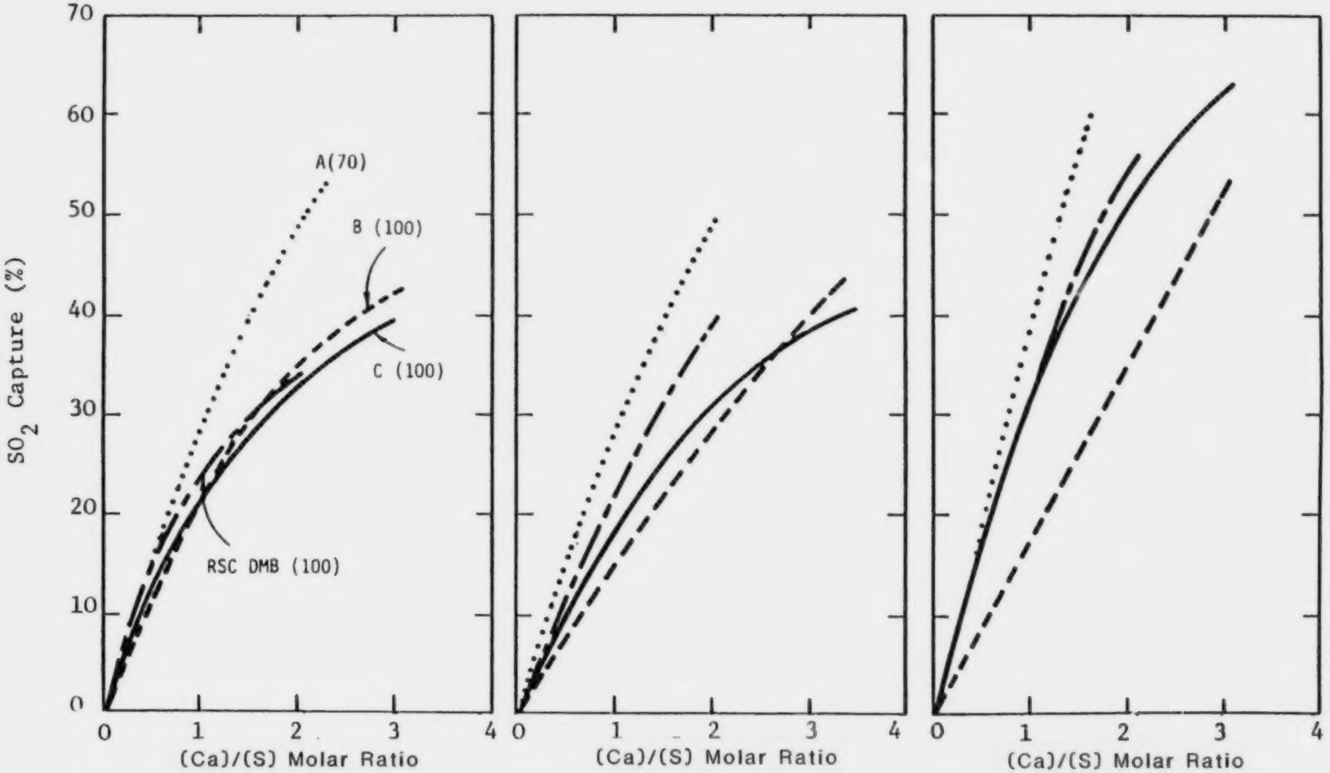
a) Vicron through Tertiary Ports

b) Vicron with coal

c) Hydrated lime through Tertiary Ports

Figure 4-17. Comparison of Sulfur Capture Potential for Burners Tested in the LWS with Utah Coal

Nominal Conditions
Full load
Optimum design point conditions
Note: Firing Rate in ( )x10^6 Btu/hr



a) Vicron Through Tertiary Ports

b) Vicron With Coal

c) Hydrated Lime Through Tertiary Ports

Figure 4-18. Comparison of Sulfur Capture Potential for Burners Tested in the LWS with Indiana Coal

The trends for SO_2 reduction with the Indiana coal were somewhat different. The 100 x 10^6 Btu/hr CCV burner was not tested with the Indiana coal due to fuel limitations, so only the RSC DMB can be compared with the other burners. Note, however, that the sulfur contents of the Indiana coal used during the RSC DMB tests was 2.73 percent compared to 1.35-1.46 percent, dry, for the other 100 x 10^6 Btu/hr burners.

For Vicron injection through the tertiary ports, all three 100 x 10^6 burners achieved similar capture of about 34 percent at Ca/S of 2. However, the RSC DMB achieved the highest SO_2 reduction for the other two sorbent/injection location combinations. Injection of Vicron with the coal yielded 38 percent capture with the RSC DMB compared to 28 and 32 percent for burners B and C, respectively. The injection of hydrated lime through the tertiary ports yielded the greatest SO_2 reduction for each burner. Once again the DMB had the highest capture of the 100 x 10^6 Btu/hr burners, 54 percent. Burner C achieved slightly lower SO_2 removal, 51 percent at Ca/S equal to 2, while burner B yielded significantly lower capture, 35 percent.

Developments of the LIMB process have not yet clearly identified the relative importance of "near-field" phenomena. The range of capture achieved by each of these burner designs suggests complex interactions. The interaction of the sorbent jet with the flame, peak flame temperature, and the effects on sorbent activation and calcination are still not well understood for large-scale systems. The large differences in SO_2 capture among these burners could therefore be related to the different mixing patterns and flame dynamics intrinsic for each burner design.

SECTION 5

CHARACTERIZATION OF THE RSC DMB

Manual measurements were made to obtain data characterizing the performance of the RSC DMB with and without sorbent materials. The detailed measurements included:

1. Temperature profile of the flame.
2. Mass loading of the fly ash particles.
3. Size distribution of the fly ash particles.
4. Analysis of the chemical composition of the fly ash.
5. Slagging and fouling characteristics.
6. SO_3 concentration in the flue gas.

Measurement of the internal flame temperature profile provides information regarding recirculation patterns and thermal environment to which sorbent materials are exposed. The physical and chemical properties of particulate matter yield information on combustion efficiency, sorbent utilization, potential impact on particle control efficiency, and slagging and fouling characteristics with and without sorbent. Only very limited detailed data was obtained for the commercial RSC burners.

5.1 INTERNAL FLAME TEMPERATURE PROFILE

The flame temperature profile of the RSC DMB was measured utilizing a water-cooled suction pyrometer. The suction pyrometer was inserted through ports on the north side of the LWS located on the burner centerline, yielding the temperature profile in Figure 5-1. Traverses through each port were made in one-foot increments, but measurements at the centerline of the furnace could not be made because of physical restrictions to the movement of the probe. The peak temperature measured in the traverse was 2320°F, about 100°-200°F lower than anticipated maximum flame temperatures. Higher temperatures could possibly have been measured at the centerline.

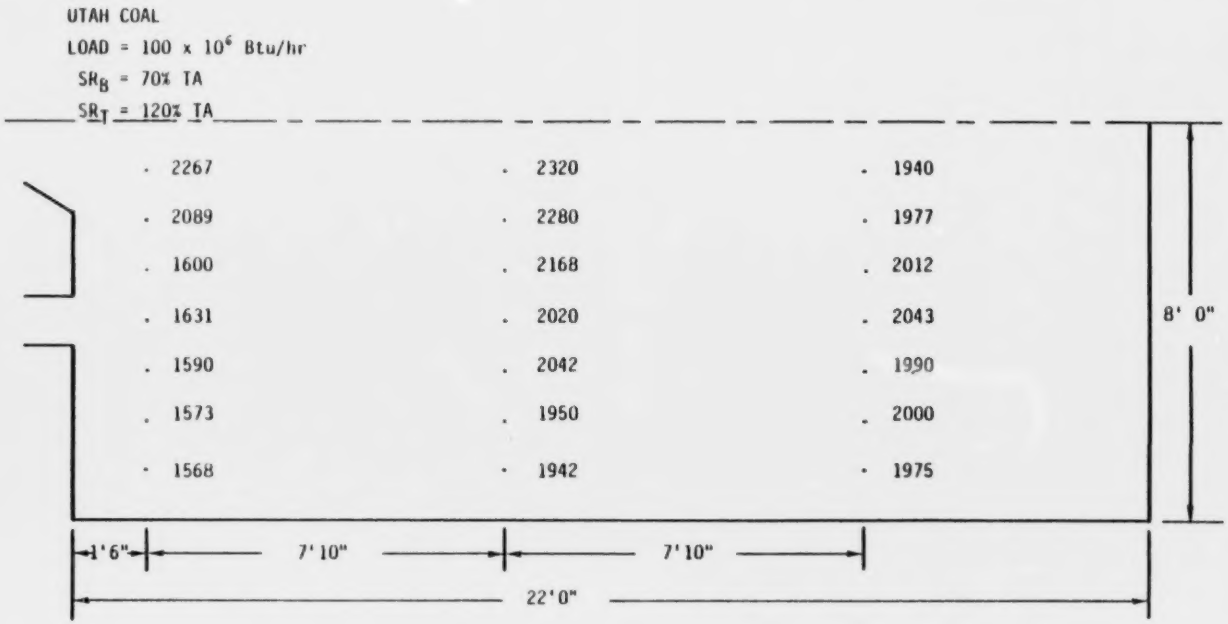

UTAH COAL
LOAD = 100 x 10⁶ Btu/hr
SR_B = 70% TA
SR_T = 120% TA
2267
2089
1600
1631
1590
1573
1568
2320
2280
2168
2020
2042
1950
1942
1940
1977
2012
2043
1990
2000
1975
8' 0"
1'6"
7'10"
7'10"
22'0"

Figure 5-1. In-Flame Temperature Profile of Horizontal Plane through RSC DMB Centerline (All Temperatures in °F)

An illustration of the temperature traverses is presented in Figure 5-2. The high tertiary velocity appears to push the flame out along the line of the tertiary ports. This produces an extended region of temperatures in the range of 1950°-2000°F in line with the path of sorbent particles injected through the tertiary air ports. Previous work has shown that the surface area of sorbent particles and, thus, their reactivity, may not be optimum at these temperatures. Temperature history, however, is but one factor in determining the effectiveness of sorbent particles.

5.2 FLY ASH CHARACTERISTICS

The physical and chemical properties of selected fly ash samples are listed in Table 5-1. The samples selected allow comparison between staged and unstaged conditions, fuel composition, and the presence or absence of sorbent materials. The analysis conducted of the samples included measurements of particle loading, size distribution, elemental analysis, and ash melting characteristics.

5.2.1 Particle Mass Loading

Measurement of particle loading was done utilizing EPA Reference Method 5, traversing across the sample duct of the LWS to obtain a representative isokinetic sample. Only two conditions were considered because of the time consuming nature of the measurement: full load, staged operation with Utah coal with and without sorbent injection. The test conditions 22.3 and 23.3 were as nearly identical as possible with the only difference being the injection of Vicron through the tertiary ports at Ca/S equal to 2 during test 23.3.

The mass loading measured for test 22.3 was 475.4 lb/hr of ash or a concentration of 3.526 gr/scf (corrected to 0% O_2). The anticipated particle loading based on coal composition was 856 lb/hr which indicates a retention in the furnace of 44 percent of the ash. For the case of sorbent injection, Test 23.3, the loading was 747.4 lb/hr of ash or a concentration of 5.486 gr/scf (corrected to 0% O_2). The additional noncombustible material in the form of Vicron increased the theoretical loading to 1239 lb/hr. This indicates that the furnace system retained 40 percent of the ash and sorbent. The indicated retention by the furnace was comparable for both test conditions. This implies that the measured increase in particle loading may be used as an indication that the additional solid material will be distributed relatively evenly among fouling material, bottom ash, and fly ash in operating boilers, with additional capacity for removal required for each system.

5.2.2 Particle Size Distribution

Particle size distribution was determined by an outside laboratory using X-ray sedimentation. Results of the analyses for

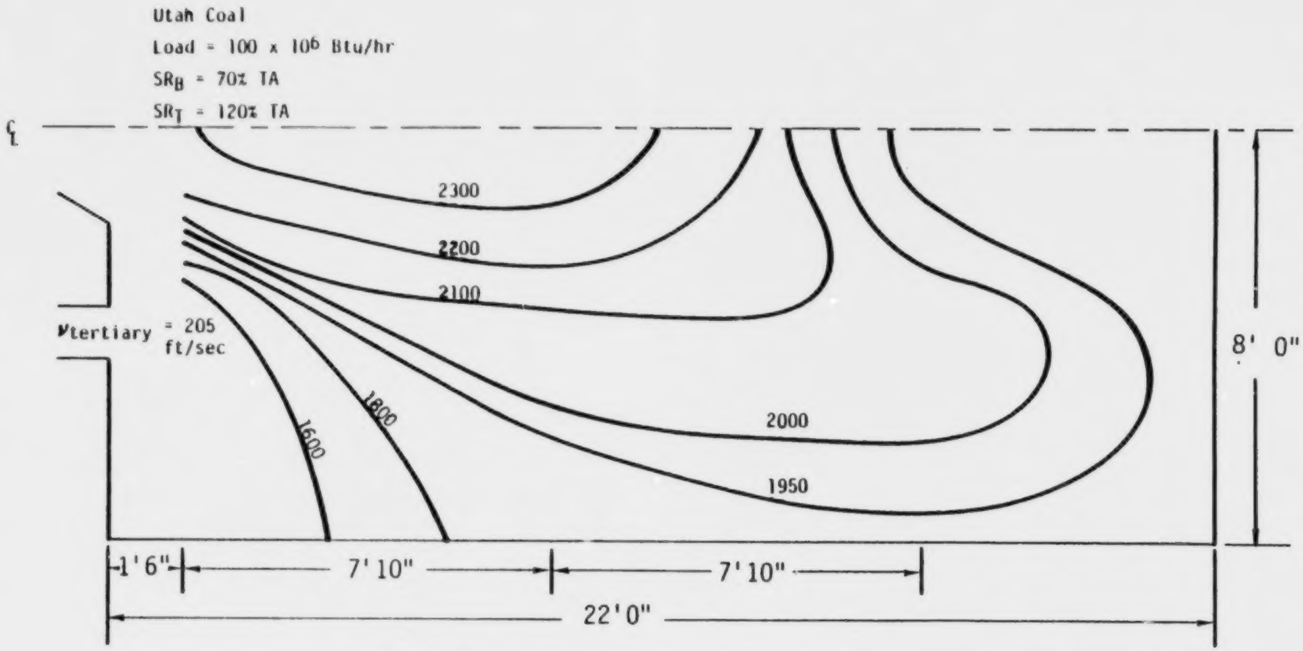

Utah Coal
Load = 100 x 10^6 Btu/hr
SR_B = 70% TA
SR_T = 120% TA
℄
V_tertiary = 205 ft/sec
2300
2200
2100
2000
1950
1800
1600
8' 0"
1'6"
7'10"
7'10"
22'0"

Figure 5-2. Estimated Isotherm Contour Profile of Horizontal Plane through RSC DMB Centerline

TABLE 5-1. SUMMARY OF PHYSICAL AND CHEMICAL PROPERTIES OF SELECTED FLY ASH SAMPLES FROM RSC DMB TESTS

		Test No.	18.1	22.3A	23.3D	20.12	21.4	14.2	14.8	16.4	17.5
Test Condition		Coal	Utah	Utah	Utah	Utah	Utah	Ind.	Ind.	Ill.	Ill.
		Load (10^6 Bt /hr)	98.8	102.1	97.4	101.2	61.7	99.3	103.0	102.7	97.8
		SRB (% TA)	114	69	71	70	69	72	71	70	70
		SRT (% TA)	121	119	122	121	117	121	120	122	121
		Sorbent	---	---	Vicron	Vicron	Vicron	---	Vicron	---	Vicron
		Location	---	---	Terts	Mill	Terts	---	Terts	---	Terts
		Ca/S	---	---	2.13	2.05	1.94	---	1.38	---	1.65
		Capture (%)	---	---	26.9	36.4	26.4	---	28.9	---	26.9
Ultimate (Dry)		C (%)	7.97	10.02	7.97	6.99	*	8.01	3.70	6.19	2.84
		H (%)	0.50	0.31	0.11	0.18	*	0.14	0.09	0.10	0.20
		N (%)	0.08	0.29	0.11	0.16	*	0.04	0.04	0.03	0.07
		S (%)	2.99	0.66	1.29	2.50	3.15	2.06	2.07	2.79	4.82
		Ash (%)	82.18	88.07	90.52	89.81	*	90.66	94.96	92.72	95.28
		O (%)	6.28	0.65	0	0.36	*	0	0	0	0
Elemental Ash		SiO_2 (%)	49.39	64.14	50.47	45.94	39.59	46.51	36.59	44.28	29.93
		Al_2O_3 (%)	17.78	19.79	15.33	16.28	14.93	22.11	20.03	19.44	13.24
		TiO_2 (%)	0.67	0.74	0.46	0.62	0.72	0.57	0.47	0.31	0.27
		Fe_2O_3 (%)	10.17	4.70	3.28	4.19	3.12	18.98	19.03	15.93	10.71
		CaO (%)	13.05	7.35	20.80	22.46	29.16	5.64	18.17	10.40	30.98
		MgO (%)	0.15	0.26	0.77	1.06	1.46	0.87	0.21	1.98	1.26
		Na_2O (%)	1.06	1.15	0.89	1.14	0.91	0.77	0.30	0.85	0.80
		K_2O (%)	1.00	0.95	0.85	0.90	0.78	0.86	0.49	1.30	1.08
		P_2O_5 (%)	0.33	0.41	0.31	0.42	0.35	0.35	0.25	0.31	0.31
		SO_3 (%)	7.35	1.85	6.34	6.65	9.11	3.79	5.35	5.89	13.10
Ash Fusion Temp	Oxid.	IDT (°F)	2180	2310	2150	2120	2160	2310	2380	2290	2140
		ST (°F)	2310	2405	2200	2190	2175	2540	2450	2420	2175
		HT (°F)	2380	2570	2250	2260	2185	2570	2475	2440	2180
		FT (°F)	2410	>2700	2430	2380	2210	2600	2525	2510	2230
	Red	IDT (°F)	2065	2305	2095	2010	2040	2140	2130	2140	2135
		ST (°F)	2190	2400	2175	2150	2150	2260	2275	2210	2150
		HT (°F)	2295	2540	2210	2180	2155	2415	2310	2285	2160
		FT (°F)	2375	2640	2385	2260	2180	2520	2395	2385	2185
		L.O.I.@ 500°C (%)	4.95	9.05	6.87	6.41	15.14	9.88	4.15	4.04	2.04
		L.O.I.@ 750° C (%)	6.37	10.12	9.33	8.99	18.22	10.11	4.85	8.07	3.80
		L.O.I.@ 1000° C (%)	6.53	10.63	9.81	9.39	19.00	11.68	5.11	8.63	4.11
		Mass Median DIA (μm)	16.8	29.5	19.0	10.7	---	11.2	16.0	12.3	14.8
		Particle Loading (lb/hr)	---	475.4	747.4	---	---	---	---	---	---
		Concent.@ 0 % O_2 (gr/scf)	---	3.526	5.486	---	---	---	---	---	---

*Insufficient sample for analysis.

tests with Utah, Indiana, and Illinois coals are presented graphically in Figures 5-3, 5-4, and 5-5, respectively. Four test conditions with Utah coal are compared in Figure 5-3. The mass median diameter varied substantially. Mass median particle size was smaller for unstaged flames (16.8 μm) than staged conditions (29.5 μm). When limestone was injected, the median particle size decreased to 19.0 μm for tertiary injection and 10.7 μm for coal nozzle addition. Laboratory tests have shown that limestone materials can exhibit severe fragmentation reducing mean sorbent size by a factor of two at in-flame temperatures. This may account in part for the bias toward smaller particles for the test of Vicron injected with the coal.

For the higher sulfur coals, injection of Vicron through the tertiaries resulted in an increase in particle size, which may or may not be significant. Further, the mass median particle diameters with no sorbent are similar for the Indiana (11.2 μm) and Illinois (12.3 μm) as are the diameters with sorbent injection for Indiana (16.0 μm) and Illinois (14.8 μm) coals.

5.2.3 Laboratory Analysis of Ash Composition

Table 5-1 summarizes the analyses performed on the ash of selected test conditions. The tests without sorbent for all the coals show relatively low carbon content, 6.19-10.02 percent. This is an indication of efficient combustion, resulting in carbon utilization under the staged conditions listed of 98.3 percent for Utah coal, 98.8 percent for Indiana coal, and 99.0 percent for Illinois coal.

Comparison of the elemental analyses of the ash mineral matter show no large variations in composition for different conditions for each coal except for the content of SiO_2, CaO, and SO_3. The CaO content rises for conditions of sorbent injection, as expected. The SO_3 also rises with sorbent material. The decrease in SiO_2 is largely due to the increase in CaO from the injected sorbent diluting its concentration.

Concentrations of CaO from the coal analyses listed in Table 3-1 predict substantially lower levels of CaO than measured from fly ash samples collected for baseline conditions of each coal during the sorbent injection studies. This implies that some of the sorbent material may have been retained in the LWS and then re-entrained during baseline conditions. The ash sample of test 18.1, Utah coal unstaged without sorbent injection, was obtained following tests of Illinois coal with sorbent injection. The analysis of sample 18.1 indicates significant carryover resulting in a sample which is probably not representative of the test conditions.

Calcium utilization efficiency can be calculated using the CaO and S content of the ash as well as from the gas phase species alone. The two methods are compared for selected conditions in Table 5-2. The agreement in the two independent methods is generally good.

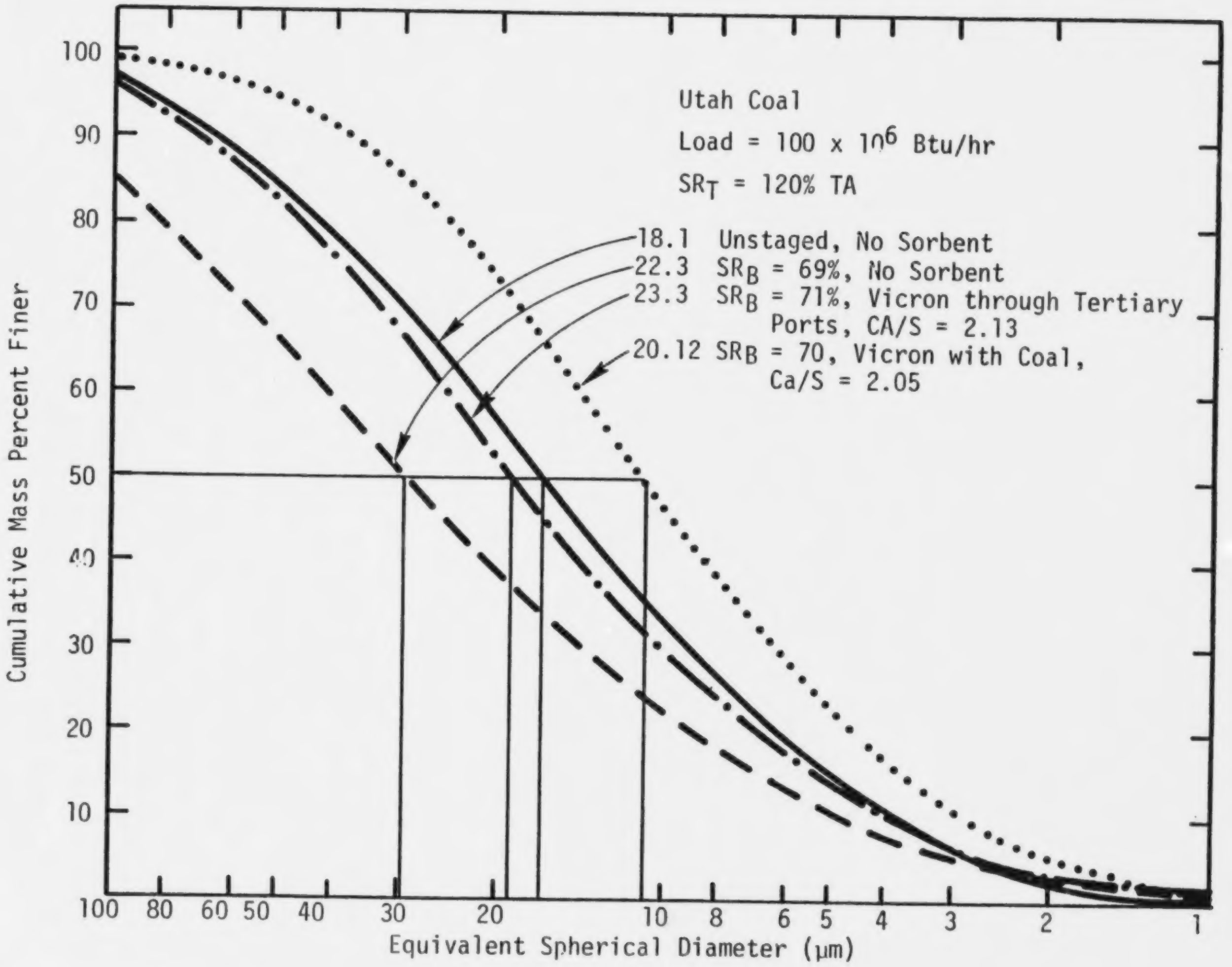


Figure 5-3. Particle Size Distributions for Utah Coal

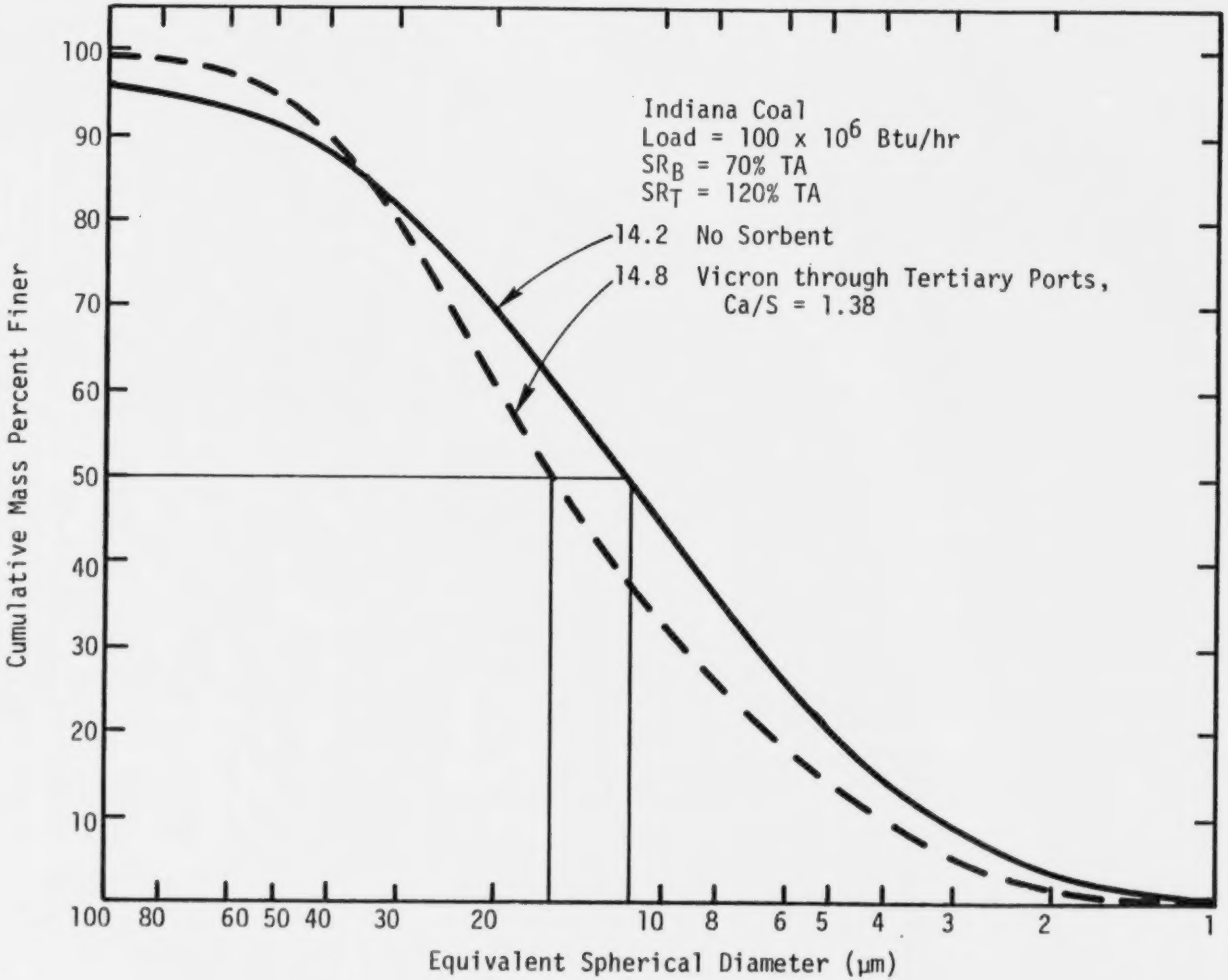


Figure 5-4. Particle Size Distributions for Indiana Coal

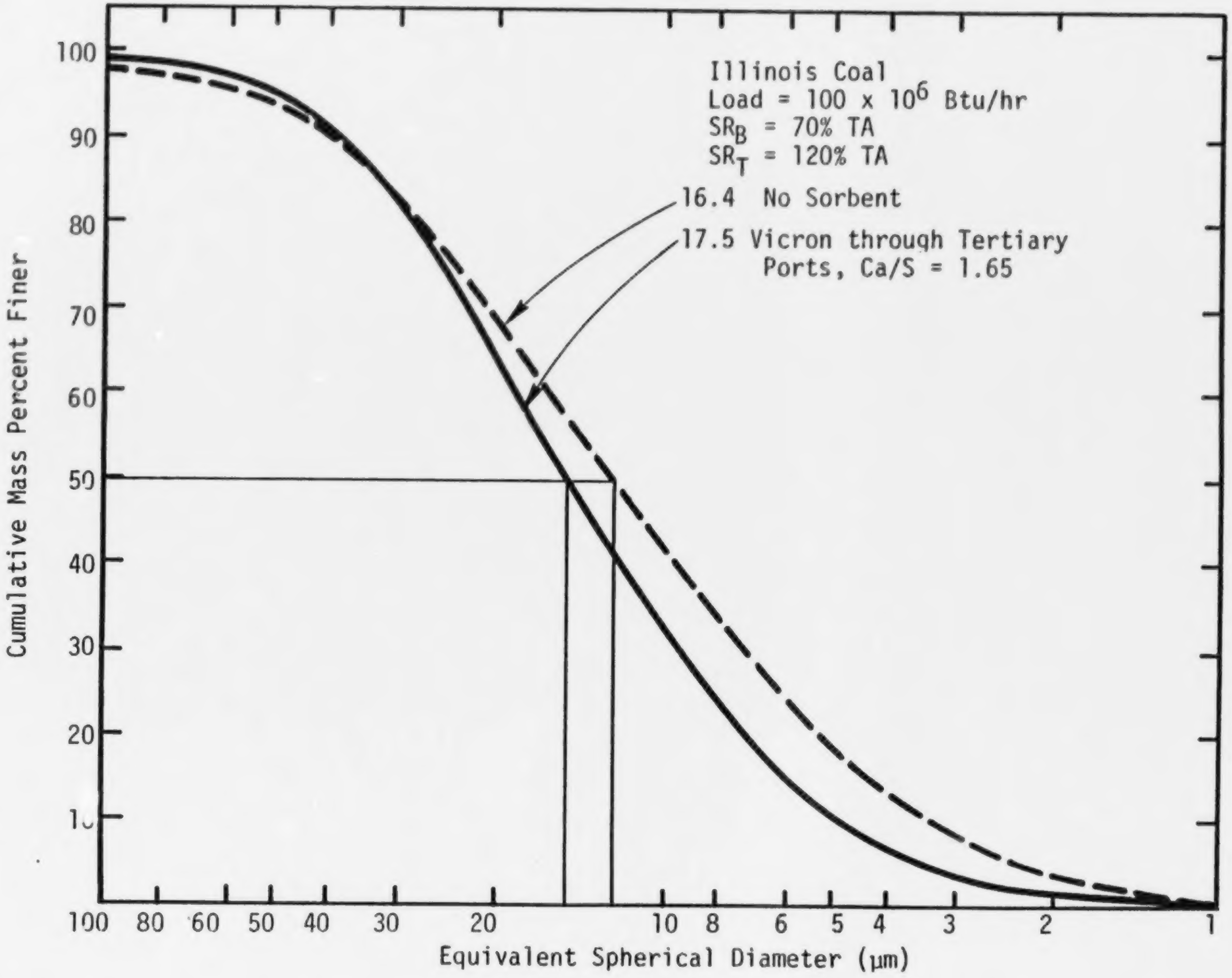


Figure 5-5. Particle Size Distributions for Illinois Coal

TABLE 5-2. COMPARISON OF SORBENT UTILIZATION EFFICIENCIES

Test No.	23.3	20.12	20.8	14.8	15.10	14.12
Coal	Utah	Utah	Utah	Indiana	Indiana	Indiana
Load (10^6 Btu/hr)	102.1	101.2	101.2	103.0	101.7	101.9
SR_B (% TA)	69	70	69	71	69	72
SR_T (% TA)	119	121	120	120	118	124
Sorbent	Vicron	Vicron	Lime	Vicron	Vicron	Limed
Location	Terts	Mill	Terts	Terts	Mill	Terts
Ca/S	2.13	2.05	2.0	1.38	1.95	1.97
Capture (%)	26.9	36.4	49.4	28.9	37.8	53.5
Ash S (%)	1.29	2.73	2.65	2.07	3.32	3.6
Ash CaO (%)	20.8	22.46	20.7	18.17	24.10	24.4
Gas Phase[1] Utilization (%)	12.6	17.8	24.7	20.9	19.4	27.2
Solid Phase[2] Utilization (%)	10.9	21.3	22.4	19.9	24.1	25.8

[1] Gas Phase Utilization $= \frac{\text{Gas Phase } SO_2 \text{ Capture (\%)}}{\text{Ca/S}}$

[2] Solid Phase Utilization $= \frac{\text{Ash S \%}}{\text{Ash CaO \%}} \times \frac{56}{32} \times 100$

Ash composition affects the melting characteristics and the tendency of the ash to slag or foul boiler surfaces. Included in Table 5-1 are ash fusion temperatures under oxidizing and reducing conditions. Reducing conditions are usually compared, since those conditions represent the worst case with lower melting temperatures. For Utah coal under staged conditions, the addition of sorbents greatly reduces the temperatures required to melt the ash. The initial deformation temperature (IDT) decreased from 2305°F with no sorbent, to 2010°F when Vicron was injected with the coal at Ca/S equal to 2.05.

The effect on the ash-melting temperatures is not as clear for the two higher sulfur coals. There is actually no significant difference in the melting points of the ash with or without sorbent until the hemispherical temperature (HT) is reached, where the sorbent added ash melts at temperatures more than 100° lower. Reduced ash fusion temperatures could greatly affect boiler operation with increased slagging and fouling.

5.3 SLAGGING AND FOULING CHARACTERISTICS

Deposition of coal particulate matter on boiler surfaces in both the radiant section and convective pass was evaluated during tests of the RSC DMB. Three refractory-faced, water-cooled panels were installed in the LWS along the burner centerline on the south and rear walls to provide deposition surfaces in the radiant zone. The slagging panels were equipped with thermocouples and a metered water flow so that heat flux through the panels could be monitored.

An array of six stainless steel tubes, 2 wide x 3 deep, cooled using a radiative heat sink, was installed above the nose of the furnace to simulate tubes in the convective pass. The fouling probe assembly above the LWS nose was equipped with thermocouples and a developmental load cell system intended to measure the rate of ash deposition on the tubes.

The deposits on the slagging panels were generally the same for each of the coals under similar operating conditions. The mass deposited tended to vary daily, but this appeared to be caused by the sloughing off of collected material either during cooling or during removal of the panels for inspection. The collected mass during sorbent injection tests was comparable to that collected with no sorbent injection. Two distinct layers formed on the panels. The layer adjacent to the surface of the panels was of a dry, powdery consistency. The outer layer, exposed to higher temperatures, was sintered and consisted of densely packed, 1/4-inch diameter nuggets. These nuggets were friable and there was no evidence of molten slag.

A typical example of panel surface temperature and heat flux changes during testing is shown in Figure 5-6. There is no measurable difference in the temperature or heat flux variations during tests with and without sorbent injection. The slagging panel surface temperature increases initially, reaching maximum temperature 2 to 3 hours after coal firing was begun. The surface temperature then decreases monotonically as the ash layer increases. The calculated heat flux remains relatively constant for the duration of the test. The impedence heat transfer of the refractory face probably masks the discrete changes in the amount of heat absorbed by the cooling water resulting from relatively small increases in the deposited ash layer.

The deposits on the fouling probes in the exit of the LWS consisted of powdery ash for each of the three coals, however, the pattern of distribution was substantially different. The deposits for the two eastern coals, Indiana and Illinois, collected on the front of the tubes, while for the Utah coal the deposits were on the back side. One possible explanation could be the different densities of the ashes. Both the Indiana and Illinois coals have high iron contents, 27.85 and 18.41 percent in ASTM coal ash. The reddish brown color of the deposits from these two coals also implies high iron content. The deposits of the Utah ash on the fouling probes were almost white in color, free of iron. Iron oxide has a substantially higher density, 5.24 gm/ml, than the ash from Utah coal, about 2.5 gm/ml. The heavier particles would tend to impact the tubes, not being able to follow the streamlines around the tubes, and collect on the front. The lighter ash particles from the Utah coal would tend to be caught in the recirculating wake of the tubes and thus collect on the back side.

Past researchers have developed indices based on coal ash composition and physical properties. Table 5-3 lists a few of the many available correlations applied to selected RSC DMB test conditions. Similar test conditions are considered for each coal: full load, staged operation with approximately 20 percent excess air. Both tertiary injection of limestone at Ca/S equal to 2 and no sorbent injection are compared. In general, the indices imply that the addition of sorbent material would tend to increase the slagging potential of the ash. Ash viscosity temperatures indicate temperatures at which slag flow properties change from Bingham plastic to Newtonian T_{cv} and at which the slag will flow on a vertical wall with a viscosity of 250 poise (T250). Dolomite ratio and Base/Acid ratio are indices of the basic constituents of the ash and have been used to predict ash viscosity properties. In general, an increase in dolomite ratio increases the slag viscosity.

Ash type is characterized as lignitic when the Fe_2O_3 concentration is less than MgO + CaO and as bituminous ashes when the Fe_2O_3 content is greater than MgO + CaO. These designations are used to separate correlations for eastern (bituminous) and western (lignite) coals. Fouling indices included in Table 5-3 are based primarily on ash type and sodium (Na_2O) content.

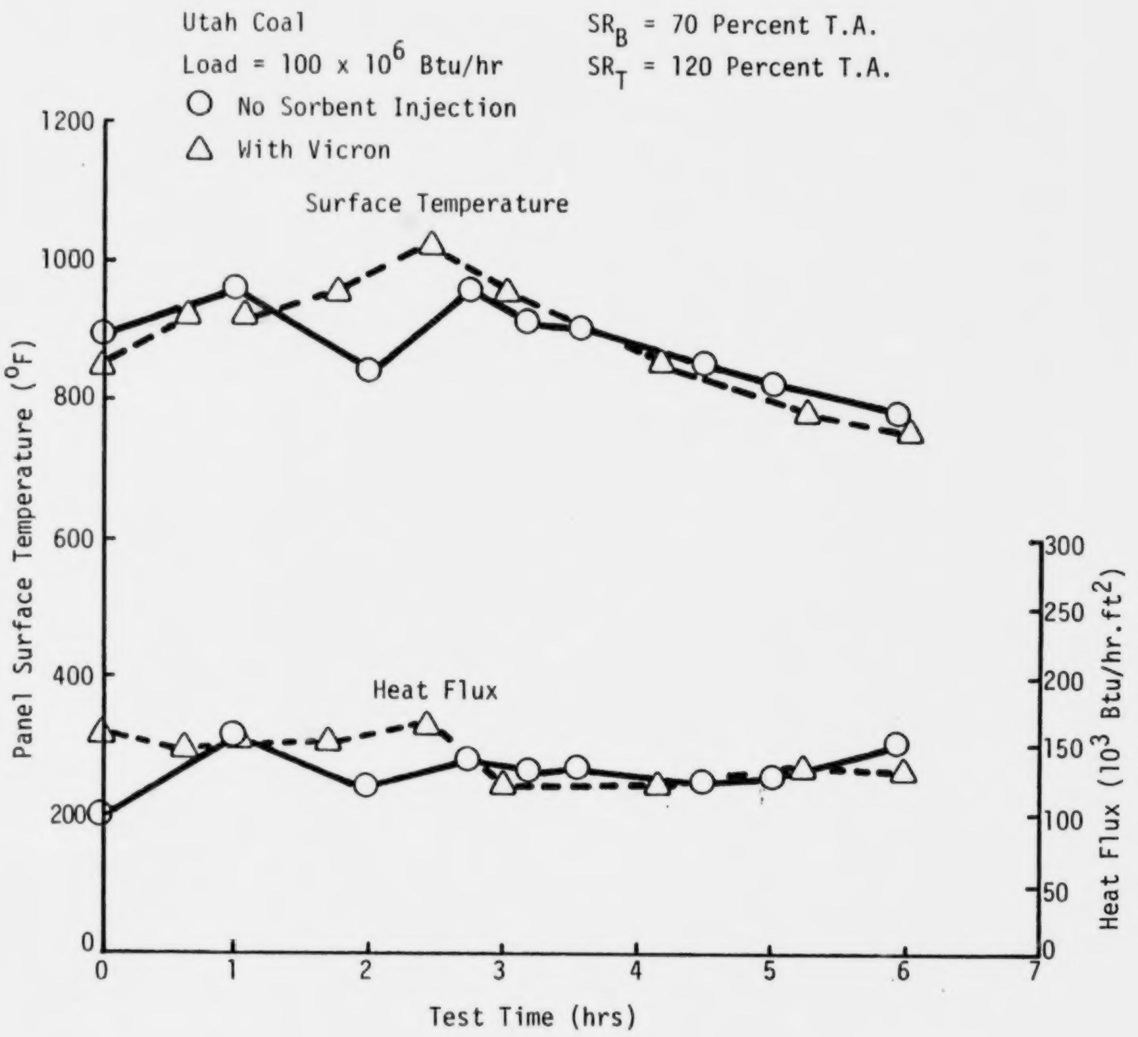


Figure 5-6. Typical Thermal History of Rear Wall Slagging Panel

TABLE 5-3. INDICES OF SLAGGING AND FOULING POTENTIAL FOR SELECTED TEST CONDITIONS

Test No.	22.3A	23.3D	14.2	14.8	16.4	17.5
Coal	Utah	Utah	Ind.	Ind.	Ill.	Ill.
Sorbent	---	Vicron	---	Vicron	---	Vicron
Location	---	Terts.	---	Terts.	---	Terts.
Ca/S	---	2.13	---	1.38	---	1.65
Measured Ash Fusion Temperature:						
IDT (°F, Red.)	2305	2095	2140	2130	2140	2135
ST (°F, Red.)	2400	2175	2260	2275	2210	2150
HT (°F, Red.)	2540	2210	2415	2310	2285	2160
FT (°F, Red.)	2640	2385	2520	2395	2385	2185
Ash Viscosity Temperature:						
T_{cv} (°F)	2740	2410	2615	2510	2485	2360
T_{250} (°F)	>2800	2403	2415	2224	2329	2252
Ash Components:						
Dolomite Ratio	52.81	81.12	24.00	48.12	40.64	71.92
Base/Acid Ratio	0.17	0.40	0.39	0.67	0.48	1.03
Ash Type	Lignite	Lignite	Bitum.	Bitum.	Bitum.	Lignite
Slagging/Fouling Indices:						
Fouling Index[a]	Low	Low	Medium	Low	Medium	Low
Fouling Index[b] (RF)	N/A	N/A	0.30	0.20	0.41	0.82
Slagging Potential (RS)	2358[d]	2126[d]	1.1[c]	1.8[c]	1.9[c]	2144[d]
Predicted ST (°F, Red.)						
Gauger[5]	2450	2300	2180	2130	2160	N/A
Schaefer[6]	2400	<2000	2040	<2000	2320	<2000
Bryers and Taylor[7]	2360	1983	2339	2179	2282	2127
Sondreal and Ellman[8]	2781	2297	2268	2100	2158	2216

Slagging/Fouling Indices [9]:

a. Based on Na_2O content in ASTM ash for coals with lignite and bituminous ash.

b. RF = Base/Acid Ratio x Na_2O for eastern coals.

c. RS = Base/Acid Ratio x % S in dry coal for eastern coals.

d. $$RS = \frac{(\text{max. HT}) + 4\ (\text{min. IT})}{5}$$ for lignitic ashes.

Although the RF index applies to eastern coals, the addition of the limestone for test 17.5 changes the ash type to lignite from bituminous. This change probably makes the RF index not applicable. RF indices between 0.2 and 0.5 are classified as medium fouling ashes, while ashes between 0.5 and 1.0 are high-fouling. Two different indices for slagging potential (RS) are presented and defined in the table. For the lignitic ashes, slagging severity is classed as medium for RS between 2250 and 2450 and classified as high for RS between 2100 to 2250. For the eastern coals, RS between 0.6 and 2.0 is indicative of medium slagging severity.

The predicted ash softening temperatures developed by previous researchers are based on ash composition. The correlations were derived from different coal data bases, but all include bituminous and some lignitic coals of the United States.

In general, these correlations imply that with the addition of calcium-based sorbents, the predicted softening temperatures decrease. ASTM measured softening temperatures, also included in Table 5-3, do not necessarily match the predicted values. This may be due to considerable scatter in the data upon which the correlations were based. Low ash softening temperature is an indication that slagging and fouling may cause problems. Softening temperature, often referred to as the ash fusion temperature, is the temperature most often used for boiler design purposes to avoid slagging and fouling.

The difference between the initial deformation temperature and fluid temperature has been used as an indication of the strength of deposits(10). As this temperature difference narrows, the deposits tend to become more difficult to remove. For all these coals and related ash samples in Table 5-3, the difference between the initial deformation temperature and fluid temperature did narrow.

These indices generally indicate that injection of sorbents into the combustion chamber of a boiler would tend to increase slagging, but decrease fouling. Although the above influence of sorbents on the behavior of coal ashes is interesting, experience with relating this behavior to the performance of coals and boilers is still limited (11, 12). It is generally agreed that such properties not be used to predict the slagging performance of coals in boilers into which sorbents have been rejected. The potential for sorbent injection to change the slagging and fouling behavior of ash cannot be generalized, but must be evaluated individually for each coal, sorbent, boiler design and operation, and sorbent injection location.

5.4 CONCENTRATION OF SO_X SPECIES

The two principal gas phase sulfur species for pulverized coal combustion systems are SO_2 and SO_3, both of which were measured for selected test conditions. SO_2 was routinely measured during sorbent injection tests utilizing the DuPont continuous SO_2 monitor and sampling system described previously. As an independent check of the continuous monitor system, measurements of SO_2 were made utilizing EPA Reference Method 6 for selected test conditions. SO_3 was measured for the same conditions using the sampling method of controlled condensation.

Results of these measurements made for full load, staged operation of the RSC DMB firing Utah coal with and without sorbent injection are listed in Table 5-4. The levels of SO_3 measured were all less than one percent of the measured SO_2 concentration, which is typical for SO_3 levels in field operating systems. Because of the accuracy of the method, levels less than 1 ppm are usually considered to be essentially zero.

TABLE 5-4. MEASURED LEVELS OF SO_x SPECIES WITH AND WITHOUT SORBENT INJECTION

Test No.	21.14	22.3	23.3
Coal	Utah	Utah	Utah
Load (10^6 Btu/hr)	65.1	104.0	101.0
SR_B (% TA)	72	69	70
SR_T (% TA)	119	119	119
Sorbent	---	---	Vicron
Location	---	---	Terts.
Ca/S	---	---	2.06
SO_3[1]@ 3% O_2, dry (ppm)	0.16	0.56	0.14
SO_2[2]@ 3% O_2, dry (ppm)	500	578	422
SO_2[3]@ 3% O_2, dry (ppm)	639	620	456

1. SO_3 by Controlled Condensation

2. SO_2 by EPA Reference Method 6

3. SO_2 by Dupont Continuous Analyzer

There is good agreement between the two methods used to determine SO_2 concentrations, with the largest relative difference in the measurements of Test 21.14. The measurement of SO_2 using the manual EPA method represents a single sample and may not be representative of the test conditions. Better agreement was achieved for the other test conditions with duplicate samples.

SECTION 6

CONCLUSIONS

The RSC DMB was evaluated in the EPA LWS for combined NO_x/SO_x reduction potential. The DMB was first parametrically optimized using all adjustable burner variables to achieve low emissions, wide operating range, and acceptable flame characteristics and efficiency. SO_2 reduction potential by the injection of calcium-based sorbents through burner passages was evaluated with three different fuels.

Two RSC commercial designs, the Flare and CCV burners, were evaluated in the LWS. Both the Flare and CCV designs were tested at scales of 50 x 10^6 and 100 x 10^6 Btu/hr. These tests provided scaling data that link test results and burner characteristics in the LWS with actual field operation. The CCV was also tested under staged conditions as a single register DMB. Limited sorbent injection tests with the Flare and CCV burners evaluated the effect of burner design on SO_2 reduction potential.

6.1 BURNER PERFORMANCE AND NO_X EMISSIONS

6.1.1 Optimization of DMB Combustion Performance

RSC DMB performance was observed to be sensitive to its adjustable burner parameters.

Coal Spreader Design. As in previous tests of RSC equipment at EER, the design of the coal impeller was a critical parameter in determining flame shape and operating characteristics. Spreader design modification was necessary to achieve stable flames with relatively low-volatile Indiana coal. The optimum spreader design utilized a 4-in. support pipe with four equally spaced, short blades set at an angle of 28°.

Coal Nozzle Position. The RSC DMB coal nozzle was designed to vary the primary setback. Retracing the nozzle tended to shorten the length of the flame, but its effect was dependent on spreader design.

Coal Spreader Position. In general, retraction of the coal impeller toward the throat of the nozzle venturi increased the coal head pressure with little effect on flame shape. Coal head pressures greater than about 10 in. H_2O tended to cause operational problems with the LWS pulverizer/primary air system.

Secondary Air Register Vane Position. The range of register positions that produced stable conditions and acceptable flame shape was narrow. Closing the register vanes to less than 20° open tended to increase flame length. Opening the registers more than 30° open resulted in the base of the flame lifting off the burner exit with resulting instability.

Secondary Air Bias. Best performance was obtained when the secondary air flow was equally distributed to the inner and outer passage. Bias to either passage resulted in longer flames.

Tertiary Air Velocity. Increasing the tertiary velocity from 90 ft/sec to about 200 ft/sec with different diameter inserts while maintaining a burner zone stoichiometry of 70 percent, tended to decrease flame length. The additional mixing enhanced by jet entrainment produced corresponding higher NO_x emissions.

Burner performance in the optimized configuration is listed in Table 6-1 for each coal tested.

TABLE 6-1. SUMMARY OF RSC DMB PERFORMANCE

Coal	Utah	Indiana	Illinois
Flame Length (ft)	20	19-20	19-20
Stability at 60% Capacity	Acceptable at SR_B = 70% TA	Acceptable at SR_B = 90% TA	Acceptable at SR_B = 70% TA
Carbon Utilization (%)	98.9	98.8	99.0
NO_x Emissions Corrected to 0% O_2 (ppm)	234	274	254

6.1.2 Commercial Burner Performance in LWS

Two commercial RSC burner designs, the Flare and CCV, were tested at two scales, 50 x 10^6 and 100 x 10^6 Btu/hr, in the EPA LWS. The two Flare burners were scaled-down versions of the original equipment burners at CILCO Duck Creek Unit 1. The CCV burners were evaluated with three coal spreader designs and under both unstaged and staged conditions. Included as one of the spreader configurations was the design retrofitted at the same CILCO boiler. Data from both scaled-down CILCO burner designs essentially calibrated the LWS with an operating utility boiler.

Both CILCO burner designs were tested at 50 x 10^6 and 100 x 10^6 Btu/hr scales to evaluate effects of burner scaling criteria and furnace thermal environment, as well as provide a link to a field unit. The flame characteristics, stability, shape, and length of the 100 x 10^6 Btu/hr Flare burner and CCV burner equipped with the conical spreader were comparable to that observed at the CILCO unit. However, the NO_x emissions were substantially lower in the LWS than measured at Duck Creek.

The tests with 50 x 10^6 Btu/hr version of the CILCO Flare and CCV burners were limited, in part due to the low firing rate, resulting in a relatively cold LWS thermal environment. High pressure drops across the coal spreaders also caused problems with the LWS primary air/pulverizer system. The flames with the low load designs were rather dull in intensity, although the flame shape was similar to the 100 x 10^6 Btu/hr burners.

NO_x emissions were lower for the 50 x 10^6 Btu/hr burners than for the 100 x 10^6 Btu/hr burners. For the Flare burners firing Utah coal, the 100 x 10^6 Btu/hr version produced NO_x emissions of 686 ppm compared to only about 580 ppm for the 50 x 10^6 Btu/hr Flare. The CCV burners firing Illinois coal produced 405 ppm NO_x for the 100 x 10^6 Btu/hr burner and 375 ppm NO_x for the 50 x 10^6 Btu/hr design.

The 100 x 10^6 Btu/hr CCV burner was also tested with two different spreaders, #5 and the long bladed #5L. Unstaged NO_x emissions with Utah coal for the CCV burner with spreader #5 were about 580 ppm and only about 470 ppm with spreader #5L. Staging the CCV burner to a burner zone stoichiometry of 70 percent theoretical reduced NO_x emissions to 274 ppm. As with the RSC DMB, the spreader design was the critical parameter in determining CCV burner performance.

6.1.3 Application of the RSC DMB to Field Operation

The performance of the 100 x 10^6 Btu/hr RSC DMB in the LWS is compared to that of the 100 x 10^6 Btu/hr commercial burners in Table 6-2. NO_x emissions from Utah coal for the DMB were over 400 ppm lower than the Flare burner and 70 ppm lower than the unstaged CILCO CCV burner. The DMB also produced 40 ppm lower NO_x emissions than the CCV burner equipped with spreader #5L. Combustion efficiency at nominal operating conditions was comparable for each of the RSC designs.

TABLE 6-2. COMPARISON OF 100 X 10^6 BTU/HR RSC BURNER PERFORMANCE WITH UTAH COAL IN THE LWS

Burner	DMB	CCV (Staged)	CCV (Unstaged)	Flare
Spreader Design	#5	#5L	BL Cone	Flare
Minimum Excess Air (%)	10	17	10	8
Minimum Load (% Capacity)	60	70	57	75
Flame Length (ft)	20	20-21	20	14-16
Carbon Utilization (%)	98.9	99.1	97.9	99.3
NO_x @ 0% O_2 (ppm)	245	274	304	686

The flame length from the DMB was the same as that of the baseline CCV burner, 20 feet, longer than for the Flare burner, 14-16 feet. Under nominal staged conditions, the RSC DMB could operate over an excess air and load range comparable to the commercial RSC designs. The DMB could therefore be expected to operate similarly in a boiler in which either the CCV or Flare burner would be installed. The RSC DMB NO_x emissions at CILCO, extrapolated using thermal environment scaling criteria, would be about 450 ppm, compared to 595 ppm and 960 ppm measured at CILCO for the CCV and Flare burners, respectively.

6.2 SO_2 REDUCTION POTENTIAL

The reduction of SO_2 emissions by the injection of sorbents through burner passages was evaluated for each of the RSC burner designs. Three sorbents, Vicron limestone, hydrated lime, and a limited number of tests with dolomite, were injected through two locations, into the coal stream and through tertiary air ports.

The reduction of SO_2 emissions with the RSC DMB by the injection of sorbents through burner passages was evaluated for each coal with three sorbent/injection location pairs, Vicron (limestone) through the tertiary air ports, Vicron with the coal at the exhauster outlet, and hydrated lime through the tertiary air ports. Injection of hydrated lime material through the tertiary ports proved to be most effective in SO_2 reduction for the RSC DMB, achieving an estimated 49 percent capture at Ca/S equal to 2.0 for each coal. Injection location did not make a significant difference in SO_2 reduction with the limestone material, with capture in the range of 35 percent at Ca/S equal to 2.0. There was no measurable effect of coal composition on the degree of SO_2 reduction achieved with any of the sorbent/injection location combinations.

The measured SO_2 capture at low load (60×10^6 Btu/hr) was slightly lower for each combination of sorbent and injection location and, as in the case of full-load tests, there was no appreciable effect of injection location on the effectiveness of the Vicron. An effect on SO_2 reduction by sorbent injection velocity was measured in a brief series of tests with Vicron. As the ratio of tertiary air velocity to sorbent injection velocity decreased an increase in SO_2 capture was observed.

The SO_2 reduction potential of sorbent injection with the commercial RSC burners was also evaluated. The most effective sorbent with the 100×10^6 Btu/hr CCV burner under staged operation was dolomite injected through the tertiary air ports with 43 percent capture at Ca/S equal to 2. The effectiveness of Vicron limestone was better when injected through the tertiary air ports (40 percent capture) than into the coal stream (36 percent). The capture achieved with hydrated lime through the tertiary air ports in the staged CCV burner was comparable to that of Vicron. There was no significant effect of staging on SO_2 capture with the CCV burner equipped with spreader #5L and Vicron injected into the coal stream.

The spreader design of the CCV burner did affect the SO_2 capture achieved with Vicron into the coal stream. With the spreader #5L configuration SO_2 capture was 35 percent and with the BL cone spreader 26 percent at a Ca/S of 2. The Flare burner achieved 26 percent capture at Ca/S equal to 2 for Utah coal and 33 percent for Illinois coal with Vicron injected into the coal stream. Only the SO_2 reduction with the Flare burner was affected by coal composition.

Thermal environment had a greater effect on SO_2 capture. The 100×10^6 Btu/hr CCV burner with the BL cone spreader achieved 39 percent SO_2 reduction at Ca/S equal to 2 at about 58×10^6 Btu/hr with Vicron in the coal stream compared to only 26 percent at full load. Similarly, SO_2 capture was about 42 percent for the 50×10^6 Btu/hr CCV burner at full load.

The injection of sorbents in the flame zone of boilers presents problems to be addressed prior to application to the field. The increased solids loading in bottom ash and fly ash will have to be accommodated. A more serious problem may be the reduction of ash melting temperatures and thus, the increased tendency towards slagging that was observed to accompany the injection of the calcium-based sorbents. For the LIMB process to become a viable control alternative, there must be additional understanding of the sorbent injection process, particle interaction, and the controlling mechanisms of sulfation.

SECTION 7

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APPENDIX A

QUALITY ASSURANCE

SECTION A

OBJECTIVES

The collection and analysis of quality data is key to the success of this program. Procedures outlined in the Quality Assurance Plan (QAPP), submitted prior to beginning actual testing, were followed to ensure data quality. Specific Quality Assurance (QA) program objectives are outlined in Table A-1. These objectives were based on the program requirement and the precision and accuracy levels achievable by the selected measurement methods. Table A-2 lists the sampling procedures for each measurement. The procedures are standard EPA, ASTM, or other recognized methods. The following QA procedures utilized during this program are divided into daily routine and system verification checks:

DAILY ROUTINE

- Air Flow Distribution
- Air Preheat and Combustor Wall Temperature
- Gas Phase Species--Continuous Monitoring
- Pretest Oil Check
- Fuel Size Distribution
- Particulate Samples
- Time Limitation of Valid Data

SYSTEM VERIFICATION

- Venturi Flowmeter Calibrations
- Instrument Performance Tests

The incorporation of the QA procedures into the test plan, ensured the documentation and collection of quality data resulting in verifiable and more accurate results and conclusions.

TABLE A-1. PROGRAM OBJECTIVES FOR MEASUREMENT PRECISION, ACCURACY, AND COMPLETENESS

Parameters	Measurement Methods	Reference	Precision: Relative Standard Deviation (%)	Accuracy (%)	Completeness (%)
Burner Settings	Direct Inspection		10	10	90
Air Distribution	Calibrated Venturi Flowmeter		4	5	90
Air Flow Rate and Distribution	Thermocouples		5	5	90
Fuel Flow Rate	Weigh Belt Feeder		4	10	90
Combustor Wall Temperature	Thermocouples		5	5	90
NO/NO_x	Continuous Monitor Chemiluminescence	EPA Performance Specification 2	2	20	90
CO	Continuous Monitor NDIR		2	20	90
CO_2	Continuous Monitor NDIR	EPA Performance Specification 3	2	20	90
SO_2	Continuous Monitor UV	EPA Performance Specification 2	2	20	90
O_2	Continuous Monitor (Paramagnetic)	EPA Performance Specification 3	2	20	90
SO_3	Controlled Condensation	Process Meas Proc EPA 68-02-2165, 2/77	20	20	80
Particulate Mass Loading	EPA Method 5		12	20	70
Particulate Size Distribution	X-Ray Sedimentation		20	20	80
Solid Composition	Ultimate and Proximate Analyses (ASTM)	ASTM	5	5	90
Fuel Size Distribution	ASTM Method	ASTM D197	10	10	80
Flame Characteristics	Color Video and Direct Inspection		Qualitative	Qualitative	75
Sorbent Feed Rate	Volumetric Feeder		10	10	90
Windbox Pressure	Magnehelic-Bourdon Tube		10	10	90

TABLE A-2. SAMPLING PROCEDURES

Parameters	Measurement Methods	Sampling Location Selection Criteria	Sampling Procedure	Sampling Frequency	Reference
Burner Settings	Direct Inspection	Burners	Direct Inspection	Every Test Condition	
Air Flow Rate and Distribution	Calibrated Venturi Flowmeter	Air Inlet Ducts		Every Test Condition	
Air Preheat Temperature	Thermocouples	Burner		Every Test Condition	
Fuel Flow Rate	Weigh Belt Feeder	Upstream of Pulverizer	Continuous Direct Weight	Every Test Condition	
Combustor Wall Temperature	Thermocouples	Selected Locations in Furnace		Every Test Condition	
NO/NO_x	Continuous Monitor Chemiluminescence	Modified EPA Performance Specifications for Continuous Monitors	Extractive (See Text)	Continuous	Fed Register Vol 44 No 197 Oct 10, 1979 pp 58602-58636
CO	Continuous Monitor NDIR				
CO_2	Continuous Monitor NDIR				
SO_2	Continuous Monitor UV				
O_2	Continuous Monitor (Paramagnetic)				
SO_3	Controlled Condensation	EPA Process Measurement Procedures		Selected Conditions	
Particulate Mass Loading	EPA Method 5	EPA Level 1 Solid Sampling Procedures	Extractive	Selected Conditions	Fed Register Vol 42 No 160 Aug 18, 1977 pp 41776-41782
Particulate Size Distribution	X-Ray Sedimentation				
Solid Composition	Ultimate and Proximate Analyses (ASTM)		Grab Sample	Daily	EPA 600/7-78-201 p 105
Fuel Size Distribution	ASTM Method	ASTM D197	Multipoint Grab Sample	Daily	ASTM D197
Flame Characteristics	Color Video and Direct Inspection	Furnace Sample Ports		Every Test Condition	
Sorbent Feed Rate	Volumetric Feeder			Every Test Condition	
Windbox Pressure	Magnehelic-Bourdon Tube			Every Test Condition	

Table A-3 summarizes the precision and accuracy results of the system measurements as determined in accordance with the QAAP. For each of the measurements, the results are within the limits established in the program goal. The oil check is an additional QA procedure used by EER to determine the overall precision and accuracy of the complete facility measurement system including air and fuel flowrates, temperature, and emission monitors. The oil check is discussed in detail in section A.1. Instrument precision is determined from repeat calibrations throughout the entire test series. The following subsections discuss each of the QA procedures for the specific measurements.

TABLE A-3. SUMMARY OF PRECISION AND ACCURACY

Measurement	Precision (%)		Accuracy (%)	
	Actual	Goal	Actual	Goal
Air Distribution	0.87	4	1.04	10
Oil Check	1.49/1.37	-	3.46/2.39	-
Fuel Flowrate	3.63	4	5.18	10
Fuel Size--Sieves	-	10	8.68/4.83	10
NO/NO_x	0.81	2	19.90	20
CO_2	0.90	2	8.18	20
CO	1.63	2	-	20
SO_2	0.60	2	8.06	20
O_2	0.08	2	8.08	20

Note: All measurements are from Phase II tests except where indicated--Phase I/Phase II.

A.1 DAILY ROUTINE PROCEDURES

Routine calibrations and checks were performed on a daily basis to ensure that test data would be accurate, representative, and reproducible. Daily calibrations included air flow indication and flue gas analyzers. Other daily checks included verification of thermocouple operation, system oxygen balance while firing oil igniter, pulverized coal size distribution, and time averaged valid data.

A.1.1 Air Flow Distribution

The distribution of combustion air between the burner passages was determined by direct measurement of the air flow rate to each passage using 18-inch venturi flowmeters. Each venturi was calibrated immediately prior to each test series using a standard pitot tube. During testing, the pressure drop of the air through each venturi was continuously monitored using low pressure electronic transducers.

Each transducer was calibrated manually prior to and immediately after testing each day at pressure differentials of 0-in. and approximately 3-in. H_2O. The calibrations are documented daily as shown in Table A-4 for a representative test day. The response from the transducers was calibrated within their linear range such that 1.0 mv response is equal to 2.0 in. H_2O pressure differential. From the calibrations, the percent drift of the transducers could be calculated to determine the precision and accuracy of the air flow measurements. Table A-5 summarizes the zero and calibration drift of the transducers during the second phase of testing. The zero drift was 0.35 percent and the calibrate on drift was 1.04 percent.

A.1.2 Air Preheat and Combustor Wall Temperatures

Type K (Chromel/Alumel) thermocouples were used to monitor the combustion air and furnace wall temperatures. ASTM Standard E231-77 specifies that the standard limit of error for Type K commercial thermocouples be ±2°C or ±0.75 percent between 0° and 1250°. To assure that the thermocouples were functioning during testing, a continuous output of the temperatures was displayed on the computer data acquisition printout. In case of thermocouple malfunction, the damaged TC was immediately replaced. If, due to location restrictions, it was not practical to replace the TC while testing, it was replaced prior to the next day of testing.

A.1.3 Gas Phase Species

The exhaust gas phase species composition was measured using the LWS laboratory sampling system as outlined in Figure A-1. Flue gas was sampled immediately upstream of the LWS system SO_x and particulate scrubber ensuring that the flue gas sample was representative of the furnace effluent. A single sample probe which draws from the center of the duct was used. All materials in contact with the sample gas are limited to glass, stainless steel, Teflon, and a small amount of Kel-F (valve seals). These materials have been demonstrated as essentially nonreactive to the gases measured over the temperature range involved in this system.

TABLE A-4. TYPICAL VENTURI FLOWMETER PRESSURE TRANSDUCER CALIBRATIONS

TRANSDUCER CALIBRATIONS

DATE: 4-5-84 FACILITY: LWS PROJECT: Riley

0756 0801 1720

TRANSDUCER/ VENTURI	ZERO		SPAN		ZERO		SPAN		ZERO		SPAN		ZERO		SPAN	
	ΔP	MV	ΔP	MV	ΔP	MV	ΔP	MV	ΔP	MV	ΔP	MV	ΔP	MV	ΔP	MV
1	0.0	.002	5.4	2.914	0.0	.037	30"	1.454								
2		.000		2.914		.033		1.440								
3		.001		2.913		.033		1.446								
4		.000		2.911		.037		1.452								
5		.001		2.915		.032		1.448								
6		.003		2.917		.039		1.538								
7	0.0	.000	5.4	2.918	0.0	.032	30"	1.450								
8																
9																
10																

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TABLE A-5. CALIBRATION DRIFT DETERMINATION OF PRESSURE TRANSDUCERS FOR AIR FLOW RATE CALCULATION

Initial Zero (MV)	Zero Error (MV)	Precision (% Difference)	Confidence Interval Zero (MV)	Zero Drift (%)	Initial Calibration[1] (mV)	Calibration Error (mV)	Calibration Precision (% Difference)	Confidence Interval (mV)	Calibration Drift (%)
0.001	0.010 ± 0.012	0.32	0.0034	0.35	3.78	0.0305 ± 0.033	0.87	0.0089	1.04

---

[1] Reference ΔP using inclined manometer.

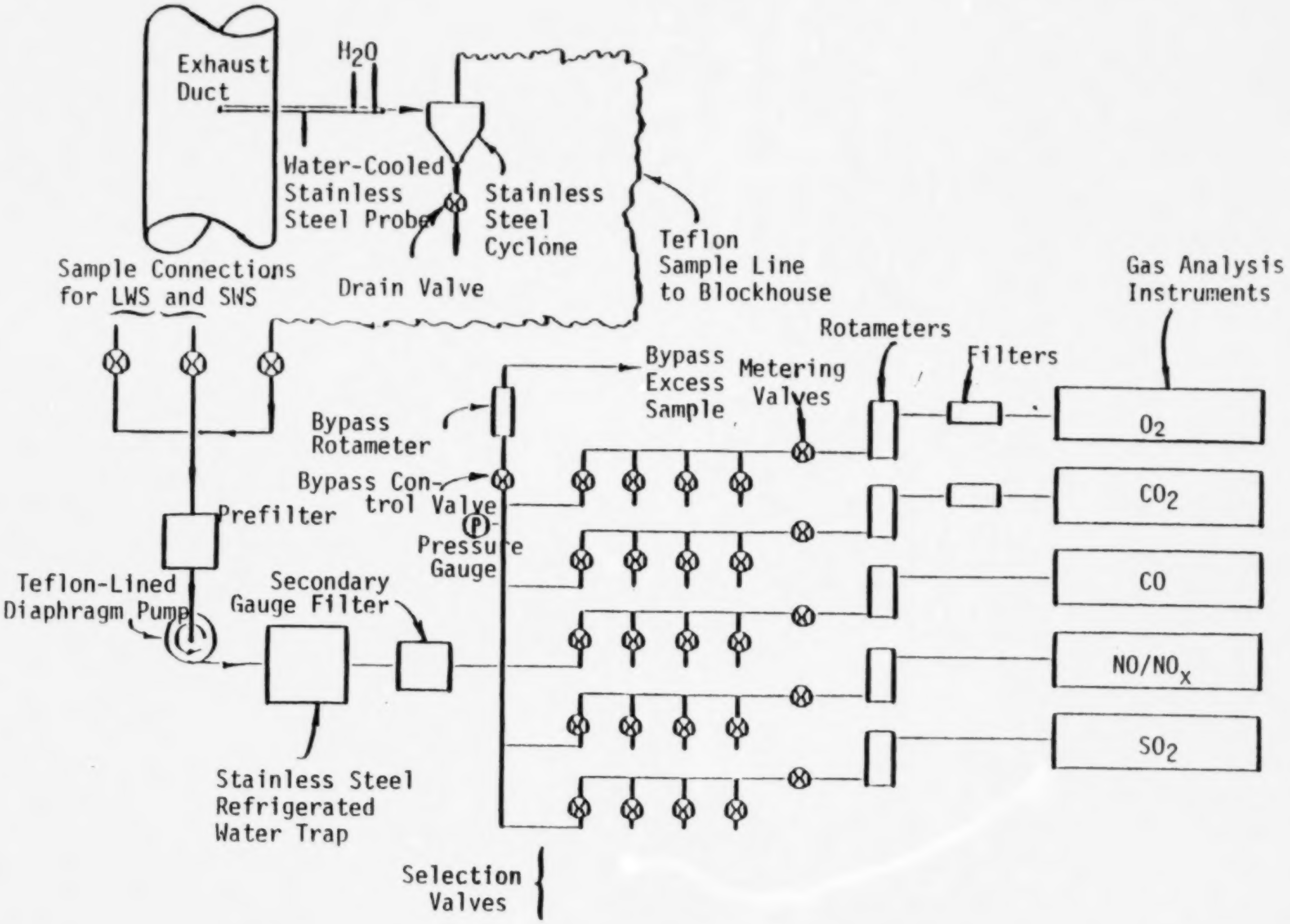

Exhaust Duct
H_2O
Water-Cooled Stainless Steel Probe
Stainless Steel Cyclone
Drain Valve
Teflon Sample Line to Blockhouse
Sample Connections for LWS and SWS
Gas Analysis Instruments
Rotameters
Filters
Bypass Excess Sample
Metering Valves
Bypass Rotameter
Bypass Control Valve
P
Pressure Gauge
Prefilter
Teflon-Lined Diaphragm Pump
Secondary Gauge Filter
Stainless Steel Refrigerated Water Trap
Selection Valves
O_2
CO_2
CO
NO/NO_x
SO_2

Figure A-1. LWS Sample Train

This system is generally satisfactory for most tests but may result in SO_2 loss if sorbents, such as limestone, are present. Therefore, an independent SO_2 sample system, described in Section 3, was utilized. The critical temperatures of the SO_2 sample system were maintained and recorded in a daily log. Table A-6 shows an example of the daily test log of temperatures and sample flows. The filter may also introduce an error in SO_2 concentration measured during sorbent injection due to agglomeration of particles on the filter, thus creating a scrubbing effect independence of the injection parameters. Therefore, this filter was changed at least after every two tests of sorbent injection had been completed or as necessary to maintain a clean filter. During sorbent testing, baseline test points (with no sorbent were taken immediately preceding sorbent injection. After the sorbent test was completed, the system was allowed to return to baseline before continuing with sorbent injection. Therefore, the relative SO_2 concentrations of the preceding and past test baseline should remain constant, therefore assuring that no measured SO_2 loss was occurring during sorbent injection because of any scrubbing effects of the sample system.

Table A-7 lists the continuous gas analyzers used during these tests. To ensure accuracy, the instruments are operated according to EPA Performance Standards 2 and 3. Each instrument was calibrated with three certified gases, a zero gas and two span gases, at approximately 50 and 90 percent of scale. To increase accuracy and precision, the instruments were calibrated approximately every two hours during the test day.

The instrument calibrations included electronically calibrating the instrument response to the data logger and the strip chart recorder, simultaneously. This ensured that the instrument, computer printout, and the strip chart were in agreement. The calibrations were documented in a calibration log, such as the example shown as Table A-8, as well as the computer printout and strip chart. This log provided data to evaluate the calibration drift of each instrument for each day of testing. Generally, if the calibration drift exceeded 4 percent during a calibration interval, the valid data obtained during that period was corrected for drift.

A.1.4 Pretest Oil Check and Coal Feed Rate Determination

A pretest oil check was completed daily, prior to switching the system to coal. The oil check is used to warm up the system and as a QA check on the overall LWS process system. The oil check is a ratio between the calculated and measured load. The calculated load is a theoretical determination based on the heating value of the fuel oil and the measured oil flow rate. It is independent of the air flow system. The measured load is a function of the O_2 concentration measured in the exhaust, and the air and fuel flow rates. The resultant ratio indicates the overall accuracy of the measurement

TABLE A-6. SO_2 SAMPLE SYSTEM QA LOG

Date: 6/8/84 Dupont : SO_2 Sample System

TIME	Sample		Zero		High Span		Low Span		Sample		Dryer Flow	Cell Temp	Oven Temp	Sample Temp (out of heated line)	Sample Temp (at probe)	Bypass Temp (at probe)	Check if changed filter
	Cell Pressure	Sample Flow	Cell Pressure	Sample Flow	Cell Pressure	Sample Flow	Cell Pressure	Sample Flow	Cell Pressure	Sample Flow							
1015	0	3	0	3	0	3			0	3	40	140	276	240	420	X	X
1200	0	3	0	3	0	3			0	3	40	137	278	290	507		X
1400	0	3	0	3	0	3			0	3	40	140	270	310	[illegible]		X
1550	0	3	0	3	0	3			0	3	40	138	275	407	483		
1650	0	3	0	3	0	3			0	3	40	138	278	315	478		

TABLE A-7. CONTINUOUS GAS ANALYZERS

Gas Measured	Type of Instrument	Manufacturer	Model No.	Range
O_2	Paramagnetic Phase I Phase II	Taylor Servomex Beckman	Type OA-272 755	10 percent
CO_2	Nondispersive Infrared (NDIR)	Anarad, Inc.	AR 500 R	20 percent
CO	Nondispersive Infrared (NDIR)	Anarad, Inc.	AR 500 R	500 ppm
NO_x	Chemiluminescent	Thermo Electron Corp.	10 AR	1000 ppm
SO_2	Long Path Nondispersive Ultraviolet (NDUV)	DuPont	400	5000 ppm

TABLE A-8. DAILY INSTRUMENT CALIBRATION

DATE: 4/16/84 FACILITY: LWS PROJECT: Riley

TIME:	9:30	9:55	11:40	1350	1530	[illegible]
O_2						
INITIAL ZERO (Z_i)-DIV/MV	0.0	0.0	0.0	0	0	
INITIAL SPAN (S_i)-DIV/MV	90	90	90	90	90	
FINAL ZERO (Z_f)-DIV.		0	0	0	0	0
FINAL SPAN (S_f)-DIV.			90		90	90
SPAN GAS (G_s) %/DIV.	9.0					
ZERO DRIFT (%) - $\frac{Z_i-Z_f}{G_s}$		0	0	0	0	0
SPAN DRIFT (%) - $\frac{S_i-S_f}{G_s}$		0	0	0	0	0
CO_2						
INITIAL ZERO (Z_i)-DIV/MV	0.0	0.0	0.0	0	0	
INITIAL SPAN (S_i)-DIV/MV	75	75	75	75	75	75
FINAL ZERO (Z_f)-DIV.		.2	.1	0.2	0	0
FINAL SPAN (S_f)-DIV.		76	76	74	73	
SPAN GAS (G_s)-%/DIV.	15.0					
ZERO DRIFT (%) - $\frac{Z_i-Z_f}{G_s}$		0.27	0.13	0.27	0	0
SPAN DRIFT (%) $\frac{S_i-S_f}{G_s}$		1.33	1.33	1.33	[illegible]	0
CO						
INITIAL ZERO (Z_i)-DIV/MV	0.0	0.0	0.0	0	0	
INITIAL SPAN (S_i)-DIV/MV	250/50	50	50	50	50	50
FINAL ZERO (Z_f)-DIV.		.1	0	0	0	0
FINAL SPAN (S_f)-DIV.		45	50	50	50	
SPAN GAS (G_s)-PPM/DIV.	250					
ZERO DRIFT (%) - $\frac{Z_i-Z_f}{G_s}$		0.20	0	0	0	0
SPAN DRIFT (%) - $\frac{S_i-S_f}{G_s}$		10.0	0	0	0	0
NO_x						
INITIAL ZERO (Z_i)-DIV/MV	0.0	0.0	0.0	0		
INITIAL SPAN (S_i)-DIV/MV	79.4	79.4	79.4	79.4		
FINAL ZERO (Z_f)-DIV.		.1	0	0	0	0
FINAL SPAN (S_f)-DIV.		79.4	79.4	80.4	80.4	79.4
SPAN GAS (G_s)-PPM/DIV.	794					
ZERO DRIFT (%) - $\frac{Z_i-Z_f}{G_s}$		0.13	0	0	0	0
SPAN DRIFT (%) - $\frac{S_i-S_f}{G_s}$		0	0	1.26	0.76 15[illegible]	0
SO_2						
INITIAL ZERO (Z_i)-DIV/MV		0.0	0.0	0		
INITIAL SPAN (S_i)-DIV/MV		90	90	90		
FINAL ZERO (Z_f)-DIV.			-.35	-1.5	0	-1.0
FINAL SPAN (S_f)-DIV			90	90	90	99.7
SPAN GAS (G_s)-PPM/DIV.		1900	3.89	1.37	0	1.11
ZERO DRIFT (%) - $\frac{Z_i-Z_f}{G_s}$			0	0	0	0.33
SPAN DRIFT (%) - $\frac{S_i-S_f}{G_s}$						

system: transducers, continuous monitoring instruments, temperatures, and fuel flow rate. The difference between the calculated and measured load had to be less than 10 percent in order to proceed with testing.

Figure A-2 (a&b) shows the daily plots of the oil checks obtained throughout the two test phases. These plots show the relative trend of the overall system. Table A-9 summarizes the accuracy and precision of the measurement system as determined by the oil check for both the test series. The accuracy for both test phases were less than 4 percent with precision less than 1.5 percent which are well below the program objectives of 10 percent.

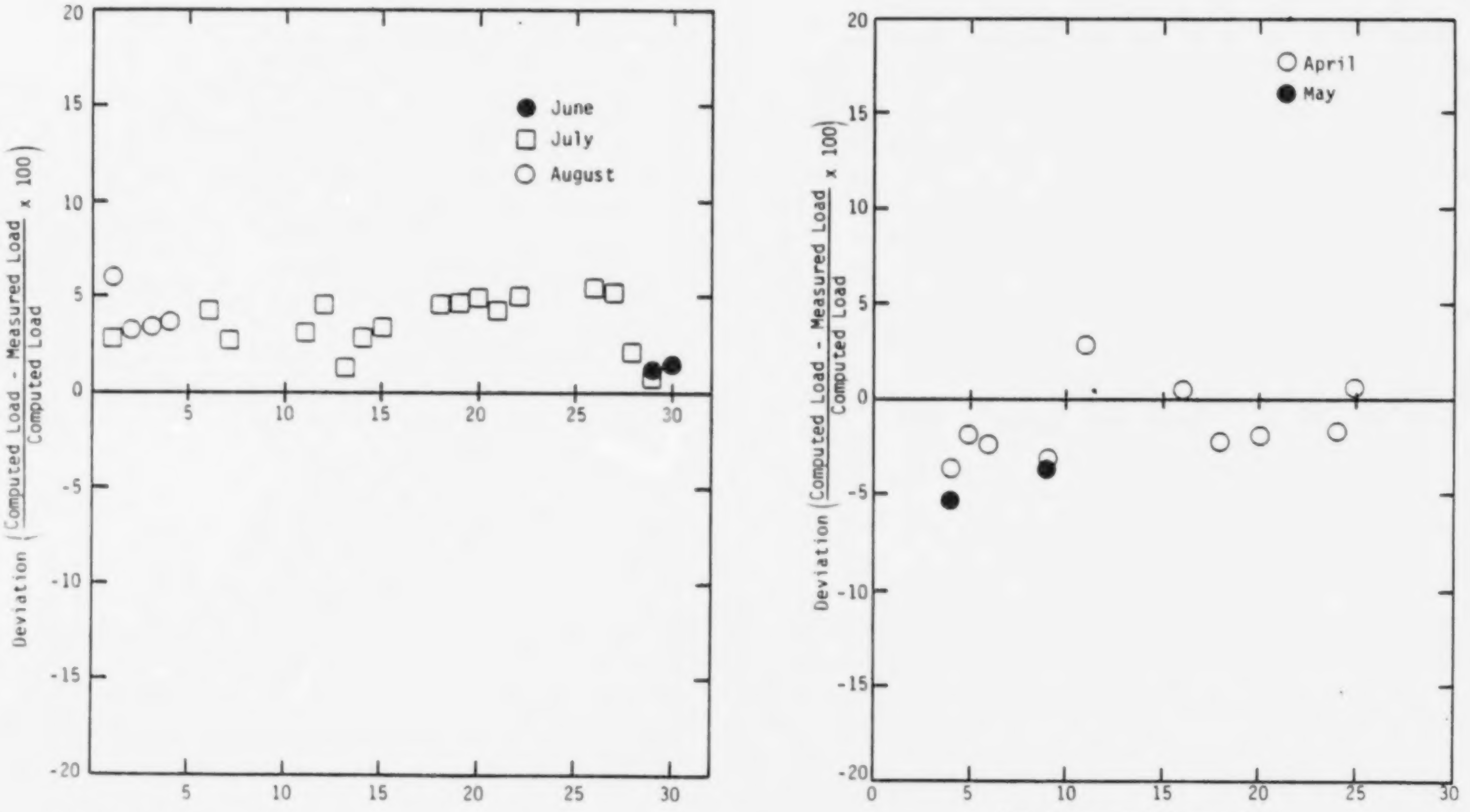
TABLE A-9. SUMMARY OF ACCURACY AND PRECISION OF MEASUREMENT SYSTEM AS DETERMINED BY OIL CHECKS

Test Phase	Accuracy (%)	Precision (%)
I-DMB	3.46	1.49
II-CCV Flare	2.39	1.37

The coal input feed rate is calculated using an oxygen balance and also a weigh belt feeder. The oil check oxygen balance verifies that the calculation of the coal firing rate is justified. The weigh belt feeder also serves to confirm the calculation. The load cell of the feeder has an accuracy of ±0.1 percent. However, it is necessary to calibrate the load cell dynamically and adjust the electronic set points according to the manufacturer's specification. The feeder was calibrated prior to the test series and during the tests as necessary after maintenance or repair.

A.1.5 Fuel Size Distribution

The coal fineness affects the combustion performance of the burner, therefore, it was necessary to determine the coal fineness daily. The coal sample was drawn isokinetically according to the procedures as outlined in ASTM Method D197 and the ASME Performance Test Code for Coal Pulverizers. The coal sample probe is shown in Figure A-3.



(a) RSC DMB Tests

(b) Commercial Burner Tests

Figure A-2. Oil Check Summary

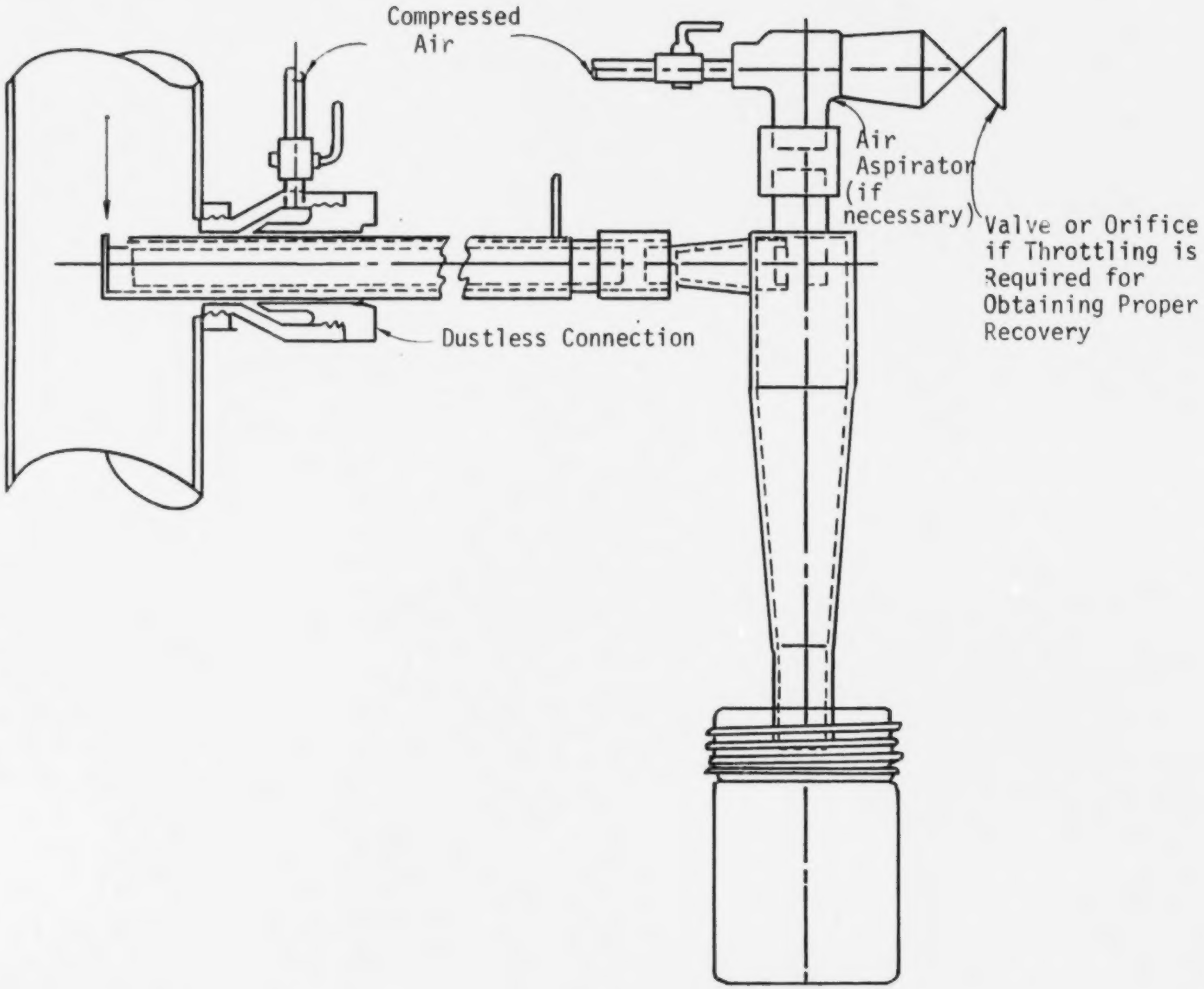

Compressed Air
Air Aspirator (if necessary)
Valve or Orifice if Throttling is Required for Obtaining Proper Recovery
Dustless Connection

Figure A-3. Pulverized Coal Sampling System

A sample was taken daily for each coal type and firing rate. An isokinetic sample is drawn by a vertical and horizontal traverse of the coal pipe at a sample location downstream of the pulverizer. The recovery rate as specified by the method must be 100 percent ± 10 percent. After each sample the recovery rate was calculated. Table A-10 shows the summary of the recovery rate obtained during the Phase II tests. If the recovery rate was not within the limits, another sample was taken if operating conditions allowed. After verifying a recovery rate of 100 ± 10 percent, the sample was analyzed for size distribution.

The main concern for burner performance was to ensure that the coal size distribution resulted in at least 70 percent passing through a 200 mesh (75 μm) ASTM sieve standard. During the DMB tests the analysis was conducted using manual tapping of the sieves. During the CCV and Flare burner tests a commercial air sieve was used. The sieves and the respective methods were calibrated using the National Bureau of Standards Reference material (SRM) 1004.

SRM 1004 is a set of calibrated glass beads with specific cumulative size distribution determined by microscopic measurement. The calibration results are summarized in Table A-11. The nominal size of 200 mesh sieve is 75 microns. However, all the openings of the sieve are not the same size. Therefore, by using the calibrated glass beads the effective opening of the sieve is determined.

To accurately determine the calibration of the sieve the same method of measurement was used that is used during testing. For Phase I, the relative accuracy of the calibration is 0 percent for the roto-tap and 8.7 percent for manual tapping. Generally, the manual method was used during testing and the accuracy is within the program limits of 10 percent. For Phase II, a commercial air sieve was used with a relative accuracy of 4.8 percent.

A.1.6 Particulate Samples (Grab Sample)

Analysis of the fly ash is essential in determining the burner/furnace performance. Therefore, during all of the major test conditions during this test series, fly ash samples were collected to obtain representative samples. Two methods were utilized:

1. Grab Sample

2. High-Volume Bag House Filter

The grab sample was collected using a standard sampling system with an ejector and a small cyclone with the sample probe in the center of the exhaust duct. The high-volume bag house draws a representative sample into the bag house using an exhauster and with the particulate matter collected on the bags. Air pulses through the

TABLE A-10. CALCULATION OF COAL FINENESS RECOVERY RATE

Project: RSC-CCV Facility: LWS

Coal Fineness Recovery Rate

			Burner Flowrate						Sample Flowrate					
Date	Time	Sample No.	K-Tron Load (lbs/hr)	Calculated Load (x10^6 Btu/hr)	Calculated Coal Flow (lbs/hr)	Coal Flow (lbs/min)	Coal Pipe Area (in.^{2})	Burner Coal Flowrate (lbs/min/in.^{2})	Coal Collected (gms)	Sample Time (min)	Sample Coal Flowrae (lbs/min)	Nozzle Area (in.^{2})	Sample Coal Flowrate (lbs/min/in.^{2})	Recovery Rate (%)
4/4/84	1445-1455	1-A	8500	100	7,689	128.14	148.414	0.8634	179.72	2	0.1979	0.305	0.6489	75.20
4/4/84	1608-1615	1-B	8400	98	7,500	125.01	148.414	0.8423	210.46	2	0.2318	0.305	0.7599	90.20
4/5/844	1245-1255	2-A	8400	96	7,347	122.45	148.414	0.8251	214.90	2	0.2367	0.305	0.7760	94.05
4/6/84	1225-1235	3-A	9500	100	8,649	144.20	148.414	0.9714	254.89	2	0.2807	0.305	0.9204	94.75
4/9/84	1517-1527	4-A	5400	55	4,757	79.29	148.414	0.5342	170.7	2	0.1880	0.305	0.6164	115.38
4/11/84	1345-1355	5-A	8200	101	7,730	128.83	148.414	0.8681	289.3	2	0.3186	0.305	1.0440	120.32
4/11/84	1400-1410	5-B	8200	100	7,653	127.56	148.414	0.8595	248.47	2	0.2736	0.305	0.8972	104.40
4/16/84	1341-1351	6-A	7700	105	8,036	133.94	148.414	0.9024	292.60	2	0.3222	0.305	1.0565	117.10
4/16/84	1400-1410	6-B	7700	105	8,036	133.94	148.414	0.9024	280.25	2	0.3086	0.305	1.0118	112.00
4/18/84	1057-1107	7-A	7700	100	7,653	127.55	148.414	0.8595	278.37	2	0.3060	0.305	1.0052	116.96
4/18/48	1110-1120	7-B	7700	105	8,036	133.94	148.414	0.9024	267.80	2	0.2949	0.305	0.9700	107.00
4/20/84	1135-1145	8-A	8700	100	7,653	127.56	148.414	0.8595	259.28	2	0.2745	0.305	0.9001	104.70
4/24/84	1255-1305	9-A	8000	102	7,997	133.30	148.414	0.8980	251.34	2	0.2768	0.305	0.9076	101.06
4/25/84	1342-1348	10-A	9300	98	8,710	145.17	148.414	0.9782	211.89	2	0.2334	0.305	0.7651	78.21
4/25/84	1405-1412	10-3	9300	98	8,710	145.17	148.414	0.9782	240.05	2	0.2644	0.305	0.8668	88.61

TABLE A-11. SUMMARY OF ASTM SIEVE CALIBRATION

Sieve No.	Sieve Nominal Opening (Microns)	Weight % Finer (EER Sieves)	Weight % Finer (NBS-SRM)	Effective Sieve Opening (Microns)	Relative Accuracy (%)
200[1]	75	49.10	49.0	75.0	0
200[2]	75	55.69	49.0	81.17	8.23
200[2]	75	55.84	49.0	81.84	9.12
200[3]	75	46.25	49.0	71.38	4.83

Notes:

1. Using Roto-tap.
2. Manual tap.
3. Commercial air-sieve.

filter every 15 seconds causing the particulate to drop into the collection container. Prior to every test condition, the bag house was purged to ensure that the subsequent sample collected was representative of that specific test condition.

Using percent carbon in the ash as a relative indicator of accuracy between the high volume sampler and grab sample resulted in an average relative accuracy of 9.3 percent. Since this is less than 10 percent, for most of the detailed analysis, the high-volume sample was used. This was due mainly to the large volume of sample which could be obtained during a short period of time in comparison to the grab sample.

A.1.7 Valid Data Acquisition

The outputs of all continuous instrumentation (flow rates, temperatures, and emissions) are converted to electrical signals, put into digital notation, and supplied to a Hewlett Packard computer. The computer processes this data and provides a real-time indication of input and output parameters. As a QA procedure, during a given test condition, valid data points are recorded which summarize that test. The valid data points yield average inputs and outputs, by manually inputting the gaseous concentrations. In addition, temperatures and flow rates are corrected if required to ensure that the results of the specific test includes only valid data and conditions.

A.2 SYSTEM VERIFICATION PROCEDURES

During this test program, system verification procedures that were performed included venturi flowmeter calibrations and instrument performance tests. The accuracy and precision of both air flow and the concentrations of exhaust gas components are essential to achieving quality data.

A.2.1 Venturi Flowmeter Calibration and Leak Checks

Calibrations of the venturi flowmeter were performed prior to the start of testing. The relationship between the air flow rate and pressure drop across the venturi can be expressed as:

$$\text{(A-1)} \quad Q = K \left(\frac{\Delta P}{T}\right)^{1/2}$$

where: Q is equal to mass flowrate through the venturi (scfm)
ΔP is equal to pressure drop across the venturi (in H_2O)
T is equal to absolute air temperature (°R)
K is equal to calibration constant

Calibrations were conducted for each venturi over a range of air flow rates, with the data reduced to the form of equation (A-1). These calibrations were incorporated into the data acquisition program used for this program. Records of the calibrations are maintained at EER.

The air flow rates measured by the venturis in the LWS system are remotely monitored. Pressure taps and thermocouples are mounted on each venturi, with the pneumatic tubing and thermocouple lead wire run into the LWS control room. Because of the environment of heat and moisture surrounding the venturis during testing, leak checks of the pneumatic tubing from the venturi to pressure transducers in the control room are conducted periodically during the test program.

A.2.2 Instrument Performance Tests

The LWS continuous monitoring system is operated according to EPA Specification 2 and 3. These specifications include instrument performance test guidelines. As part of the QA plan for this test series, an abbreviated instrument performance test was conducted. Table A-12 summarizes the results for both test series.

The relative accuracy was determined by comparing the instrument values to values obtained using EPA Reference Methods. There is currently no performance specification for the CO monitor or standard reference method for CO determination. Therefore, relative accuracy for CO could not be determined, but the 2-hour drift test was conducted in accordance with the guidelines for the other analyzers.

The results show that the relative accuracy for the O_2, CO_2, and NO_x instruments were within specifications for each test series. The increase in relative accuracy during the second phase of the NO_x tests is probably related to a decrease in number of samples due to sampling limitations and laboratory analysis problems. The decrease in number of samples generally reduces the statistical accuracy of a set of measurements.

The relative accuracy of the DuPont SO_2 instrument was not within EPA specifications for Phase I. The result is biased by a large error, almost 28 percent in one of the five Method 6 samples. The other four samples were in better agreement with the SO_2 concentration simultaneously measured by the DuPont analyzer. Excluding the sample with the large error improves the relative accuracy to 16.2 percent which is within EPA Performance Specification 2.

The O_2, CO_2, NO_x, and SO_2 instruments are within the specifications for zero and calibration drift for both test phases. The CO instrument had higher calibration drift than allowed for the other instruments. This may be related to the high sensitivity of the instruments at high span values. This drift is probably also related

TABLE A-12. INSTRUMENT PERFORMANCE TESTS SUMMARY

Instrument/Manufacturer	Relative Accuracy (%)		EPA Specification	Calibration Error[2] (%)		EPA Specification	2-Hour Drift Test					
							Zero		EPA Specification	Calibration		EPA Specification
	Phase I	Phase II		Mid	High		Phase I	Phase II		Phase I	Phase II	
O_2--Taylor Servomex/ Beckman	7.32	8.08	≤20	2.10	0.86	≤5	0.26	0.20	≤0.4	0.11	0.20	≤0.4
CO_2--Anarad, Inc.	3.91	8.18	≤20	0	0.67	≤5	0.11	0.22	≤0.4	0.21	0.36	≤0.4
NO, NO_x--TECO	6.43[3]	19.90[3]	≤20	0	0.096	≤5	0.43	0.16	≤2.0	1.28	2.01	≤2.0
SO_2--DuPont	24.46	8.06	≤20	0.61	0.54	≤5	0.79	0.84	≤2.0	0.77	1.28	≤2.0
CO--Anarad, Inc.	---	---	---	1.08	1.84	--	0.60	0.85	--	4.76	3.72	--

Notes:

1. Beckman O_2 used for Phase II test.
2. Calibration error determination only during Phase II test series.
3. Results calculated on lb/mbtu basis.

to inherent problems with drift in NDIR instruments due to temperature fluctuations. The calibration error determines the linearity of the instruments. For each of the instruments the linearity is within acceptable limits established in the EPA specifications.

APPENDIX B

QUALITY ASSURANCE CALCULATIONS AND DATA ANALYSIS

B.0 QUALITY ASSURANCE CALCULATIONS AND DATA ANALYSIS

This appendix includes the following instrument performance data collected during the DMB and the CCV/Flare burner tests as applicable:

B.1 CALIBRATION ERROR

a) O_2 - Beckman (Paramagnetic)
b) CO - Anarad (NDIR)
c) NO_x - TECO (Chemiluminescent)
d) CO_2 - Anarad (NDIR)
e) SO_2 - DuPont (NDUV)

B.2 RELATIVE ACCURACY DETERMINATION

a) O_2 - Taylor (DMB)
- Beckman (CCV/Flare)
b) CO_2 - Anarad
c) NO_x - TECO
d) SO_2 - DuPont

B.3 ZERO AND CALIBRATION DRIFT (2 HR)

a) O_2 - Beckman
b) CO - Anarad
c) NO_x - TECO
d) CO_2 - Anarad
e) SO_2 - DuPont

B.4 DATA CALCULATION SHEETS

Also included are the calculation sheets used in determining particulate mass loading and SO_2/SO_3 concentrations as completed for each test phase.

The forms and equations referred to were extracted directly from the Federal Register, Vol. 44, No. 97 of Wednesday, October 10, 1979, pp. 58602-58636. This reference documents "Standards of Performance for New Stationary Sources; Continuous Monitoring Performance Specifications." The following equations from this document were used in the following worksheets:

Arithmetic Mean $$\overline{x} = \frac{1}{n} \sum_{i=1}^{n} x_i \qquad (B\text{-}1)$$

Confidence Interval $$C.I._{95} = \frac{t_{.975}}{n\sqrt{n-1}} \sqrt{n\,(\Sigma x_i^2) - (\Sigma x_i)^2} \qquad (B\text{-}2)$$

Relative Accuracy $$R.A. = \frac{|\overline{x}| + |C.I._{.95}|}{R.V.} \times 100 \qquad (B\text{-}3)$$

where: $\overline{x}$ = mean value

n = number of data points

$\sum_{i=1}^{n} x_i$ = algebraic sum of the individual measurements

$C.I_{.95}$ = 95 percent confidence interval estimate of the average mean value

$t_{.975}$ = Student's t distribution value for n data points

R.V. = reference value as defined in the above document.

APPENDIX B.1

INSTRUMENT CALIBRATION ERROR

3/27/84

CCV/FLARE

O_2- BECKMAN Calibration Error Determination

Run no.	Calibration gas concentration[a] %	Measurement system reading %	Arithmetic differences %	
	A	B	A-B	
			Mid	High
1 Z	0	0 0		
2 L	5%	5%	0	
3 H	9%	8.93%		0.07
4 L	5%	5%	0	
5 H	9%	8.93%		0.07
6 L	5%	5%	0	
7 H	9%	8.93%		0.07
8 Z	0	-.2.18 -.218		
9 L	5%	4.88%	0.12	
10 H	9%	8.93		0.07
11 Z	0	-.218 -.218		
12 L	5%	4.88%	0.12	
13 H	9%	8.92		0.02
14 L	5%	57	0	
15 Z	0	-.226 -0.226		
Arithmetic Mean (Eq. B-1) =			0.0480	0.0720
Confidence Interval (Eq. B-2) =			0.0650	0.0056
Calibration Error (Eq. B-3)[b] =			2.10	0.8622

[a] Calibration Data from Section 5.1.1 or 5.1.2

Mid-level: C = 50%

High-level: D = 90%

[b] Use C or D as R.V. in Eq. B-3

CCV/FLARE

4/2/84

CO-ANARAD

Calibration Error Determination

Run no.	Calibration gas concentration[a] %	Measurement system reading %	Arithmetic differences %	
	A	B	A-B	
			Mid	High
1 Z	0	0/0		
2 L	250	250/50.0	0	
3 H	402	402/81 405		3
4 L	250	250/ 49.9 2495	0.5	
5 H	402	402 / 81.5 4075		5.5
6 Z	0	0/0		
7 H	402	402/ 81.5 4075		5.5
8 Z	0	0/0		
9 L	250	250/49.9 2495	0.5	
10 H	402	402/ 81.5 407.5		5.5
11 Z	0	0/0		
12 L	250	250/ 49.5 247.5	2.5	
13 H	402	402/81.9 409.5		7.5
14 L	250	250/49.5 247.5	2.5	
15 Z	0	0/0		
Arithmetic Mean (Eq. B-1) =			1.20	5.40
Confidence Interval (Eq. B-2) =			1.4949	1.9925
Calibration Error (Eq. B-3)[b] =			1.08	1.8364

[a] Calibration Data from Section 5.1.1 or 5.1.2

Mid-level: C = 250 ppm

High-level: D = 402 ppm

[b] Use C or D as R.V. in Eq. B-3

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794 T-712478
502 XA3510
zero T403136

CCV/FLARE

NOx - TECO Calibration Error Determination

Run no.	Calibration gas concentration[a] - %	Measurement system reading %	Arithmetic differences %	
	A	B	A-B	
			Mid	High
1 Z	0	0		
2 L	502	502/50.2	0	
3 H	794	794/794		0
4 L	502	502/50.2	0	
5 H	794	794/79.4		0
6 Z	0	0/0		
7 H	794	794/79.4		0
8 Z	0	0		
9 L	502	502/502	0	
10 H	79.4	794/79.35		0.05
11 Z	0	0		
12 L	502	502/50.2	0	
13 H	79.4	794/79.5		1
14 L	502	502/5.02	0	
15 Z	0	0		
		Arithmetic Mean (Eq. B-1) =	0	0.2100
		Confidence Interval (Eq. B-2) =	0	0.5489
		Calibration Error (Eq. B-3)[b] =	0	0.0956

[a] Calibration Data from Section 5.1.1 or 5.1.2

Mid-level: C = 502 ppm

High-level: D = 794 ppm

[b] Use C or D as R.V. in Eq. B-3

CCV/FLARE

CO₂-Anarad Calibration Error Determination

Run no.	Calibration gas concentration[a] %	Measurement system reading %	Arithmetic differences %	
	A	B	A-B	
		Def / % ppm	Mid	High
1 Z	0	0 / 0 0		
2 4	5%	25 / 5	0	
3 H	14.9	75 / 15		0.1
4 Z	0	0 / 0 0		
5 L	5%	25 / 5	0	
6 H	14.9	75.7 / 15%		0.1
7 Z	0	0/0 0		
8 Z	5%	25/ 5	0	
9 H	14.9	75/15 0		0.1
10 Z	0	0/0 0		
11 Z	5%	25/5	0	
12 H	14.9	75/15		0.1
13 Z	0	0/0 0		
14 L	5%	25/5	0	
15 H	14.9	75/15		0.1
Arithmetic Mean (Eq. B-1) =			0	0.10
Confidence Interval (Eq. B-2) =			0	0
Calibration Error (Eq. B-3)[b] =			0	0.67

[a] Calibration Data from Section 5.1.1 or 5.1.2

Mid-level: C = 5.0 % ~~ppm~~

High-level: D = 14.9 ppm

[b] Use C or D as R.V. in Eq. B-3

AAL-1268A High SPAN 180~ JSJ - JB

T714754 Low SPAN 1004 - 4-2-84

T 29604? Zero N~ CCV/FLARE Dupont SO~

SO_2 - DUPONT.

Calibration Error Determination

Run no.	Calibration gas concentration[a] %	Measurement system reading %	Arithmetic differences %	
	A	B	A-B	
		Det / conc	Mid	High
1 Z	0	0 /		
2 L	1004	502 / 1004	0	
3 H	1802.	89.6 / 1792		10
4 L	1004	49.9 / 998	6	
5 H	1802	89.8 / 1796		6
6 Z	0	.2 / 4.0		
7 H	1802	90.1 / 1802		0
8 Z	0	0 / 0		
9 L	1004	50.0 / 1000	4	
10 H	1802	90.3 / 1806		4
11 Z	0.0	-.2 / -4		
12 L	1004	500 / 1000	4	
13 H	1802	898 / 1796		6
14 L	1004	50.2 / 1004	0	
15 Z	0	-.2 / -4.0 ppm		
Arithmetic Mean (Eq. B-1) =			2.80	5.200
Confidence Interval (Eq. B-2) =			3.33	4.5105
Calibration Error (Eq. B-3)[b] =			0.6105	0.5389

[a] Calibration Data from Section 5.1.1 or 5.1.2

Mid-level: C = 1004 ppm

High-level: D = 1802 ppm

[b] Use C or D as R.V. in Eq. B-3

APPENDIX B.2

INSTRUMENT RELATIVE ACCURACY

R3C DMB

Instrument Performance test

O_2 and CO_2

Run no.	Date and time	SO_2 RM	SO_2 M[d]	SO_2 Diff	NO_x[b] RM	NO_x[b] M[d]	NO_x[b] Diff	CO_2 or O_2[a] RM[d]	CO_2 or O_2[a] M[d]	CO_2 / ~~SO_2~~[a] RM	CO_2 / ~~SO_2~~[a] M	CO_2 / ~~SO_2~~[a] Diff	NO_x[a] RM	NO_x[a] M	NO_x[a] Diff
		ppm			ppm		←	%	%	mass/GCV			mass/GCV		
1	7-27-83 1527-1532						0.33	4.47	14.8	14.93	13.80	1.13			
2	7-27 1503-1506						0.07	3.87	3.8	14.8	14.8	0			
3	8-1 1639-1644						0.5	3.1	3.6	15.3	15.5	0.2			
4	8-2 1304-1307						0.1	3.4	3.5	15.4	15.1	0.3			
5	8-2 1550-1553						0.0	3.4	3.9	15.6	15.3	0.3			
6	8-2 1639-1641						0.0	3.4	3.4	15.6	15.1	0.5			
7	8-3 1632-1635						0.3	4.0	3.7	14.7	15.0	0.3			
8	8-4 1229-1232						0.2	4.4	4.2	14.6	14.6	0			
9	8-4 1410-1413						0.2	3.8	3.6	15.4	15.0	0.4			
10	8-4 1550-1554						0.0	3.3	3.3	15.6	15.0	0.6			
11	8-4 1706-1708						0.1	3.7	3.6	15.3	14.8	0.5			
12															
Average							0.1636	3.713		15.20		0.3845			
Confidence Interval							0.1082					0.2103			
Accuracy[c]							7.32					3.91			

[a] For steam generators [b] Average of 3 samples [c] Use average of reference method test results for R.V.

[d] Make sure that RM and M data are on a consistent basis, either wet or dry

Relative accuracy determination

RSC DMB– NOx Instrument Performance TEST

Run no.	Date and time	SO_2 RM	SO_2 M[d] ppm	SO_2 Diff	NO_x[b] RM	NO_x[b] M[d] ppm	NO_x[b] Diff	CO_2 or O_2[a] RM[d] %	CO_2 or O_2[a] M[d] %	SO_2[a] RM	SO_2[a] M mass/GCV	SO_2[a] Diff	NO_x[a] RM	NO_x[a] M mass/GCV	NO_x[a] Diff
1	7-27 1521-1525				220	220	0	5.07	4.9				0.3386	0.3351	0.0035
2	7-27 1527-1532				205	220	15	5.47	5.0				0.3237	0.3372	0.0135
3	7-27 1534-1537				207	205*	2	5.05	5.00				0.3182	0.3142	0.0040
4															
5															
6															
7															
8															
9															
10															
11															
12															
Average					210.7		5.67						0.3268		0.0070
Confidence Interval							20.23								0.0140
Accuracy[c]					12.29								6.426		

[a] For steam generators [b] Average of 3 samples [c] Use average of reference method test results for R.V.

[d] Make sure that RM and M data are on a consistent basis, either wet or dry

Relative accuracy determination

* - 2 samples

Revises 1/11/84

RSC DMB
SO_2 - Instrument performance test

Run no.	Date and time	SO_2 RM	SO_2 M w/d [d] ppm	SO_2 Diff	NO_x[b] RM	NO_x M [d] ppm	NO_x Diff	CO_2 or O_2[a] RM % [d]	CO_2 or O_2 M % [d]	SO_2[a] RM mass/GCV	SO_2 M	SO_2 Diff	NO_x[a] RM mass/GCV	NO_x M	NO_x Diff
1	8-1 1555-1611	500	520/639	139	←			*3.0	3.0						
2	8-2 1239-1312	578	550/617	38				3.4	3.5						
3	8-2 1545-1509	553	560/623	70				3.4	3.3						
4	8-3 1253-1317	422	400/453	31				*3.0	3.0						
5	8-3 1510-1559	400	400/460	60				*3.8	3.8						
6															
7															
8															
9															
10															
11															
12															
Average		488.3		67.6	49.75										
Confidence Interval				53.32	29.12										
Accuracy[c]				24.46	16.15										

[a] For steam generators [b] Average of 3 samples [c] Use average of reference method test results for R.V.

[d] Make sure that RM and M data are on a consistent basis, either wet or dry

Relative accuracy determination

O_2 and CO_2 Instrument Performance Test
CCV/FLARE

Run no.	Date and time	CO_2 ~~SO_2~~			O_2 ~~NO_x~~ [b]			CO_2 or O_2 [a]		SO_2 [a]			NO_x [a]		
		RM	M	Diff	RM	M	Diff	RM	M	RM	M	Diff	RM	M	Diff
		ppm[d]			ppm[d]			%[d]	%[d]	mass/GCV			mass/GCV		
1	4-6-84 1431	14.3	15.6	1.30	4.1	4.3	0.2	c							
2	4-6-84 1432	14.7	16.2	1.50	3.6	3.4	0.2								
3	4-6-84 1433	14.6	16.0	1.4	3.7	3.3	0.4								
4	4-6-84 1435	15.1	16.0	0.9	3.4	3.6	0.2								
5	4-6-84 1437	14.1	15.4	1.3	4.3	4.0	0.3								
6	4-6-84 1545	14.6	15.6	1.0	3.8	3.7	0.1								
7	4-6-84 1547	14.6	15.4	0.8	3.9	3.9	0								
8	4-6-84 1548	14.5	15.4	0.9	3.8	4.1	0.3								
9	5-9-84 912	14.9	15.4	0.5	3.3	2.9	0.4								
10	5-9-84 914	15.1	15.4	0.3	3.5	3.2	0.3								
11	5-9-84 916	14.3	14.8	0.5	3.8	3.6	0.2								
12	4-6-84 1546	14.6	15.6	1.0	3.7	3.8	0.1								
Average		14.62		0.9500	3.717		0.2250								
Confidence Interval				0.2431			0.0772								
Accuracy[c]		8.16			8.08										

[a] For steam generators [b] Average of 3 samples [c] Use average of reference method test results for R.V.

[d] Make sure that RM and M data are on a consistent basis, either wet or dry

Relative accuracy determination

NOx Instrument Performance Test
PCV/Flare

Run no.	Date and time	SO_2			NO_x[b]			CO_2 or O_2[a]		SO_2[a]			NO_x[a]		
		RM	M	Diff	RM	M	Diff	RM	M	RM	M	Diff	RM	M	Diff
		ppm[d]			ppm[d]			%[d]	%[d]	mass/GCV			mass/GCV		
1	4-6-84 1431-1433				333	290	43	3.80	3.70				0.4747	0.4110	0.0637
2	4-6-84 1435-1437				332	270	62	3.85	3.70				0.4747	0.3827	0.0920
3	4-6-84 1545-1548				323	345	22	3.81	3.90				0.4605	0.4947	0.0342
4	5-9-84 0912-0914				230	265	35	3.40	3.10				0.3204	0.3630	0.0426
5	5-9-84 0916-0918				283	272	11	3.83	3.50				0.4042	0.3811	0.0231
6															
7															
8															
9															
10															
11															
12															
Average					300.2		34.60						0.4269		0.05112
Confidence Interval							24.34								0.03385
Accuracy[c]						19.63								19.90	

[a] For steam generators [b] Average of 3 samples [c] Use average of reference method test results for R.V.

[d] Make sure that RM and M data are on a consistent basis, either wet or dry

Relative accuracy determination

SO_2 INSTRUMENT PERFORMANCE TEST - CCV/FLARE

Run no.	Date and time	SO_2			NO_x[b]			CO_2 or O_2[a]		SO_2[a]			NO_x[a]		
		RM	M	Diff	RM	M	Diff	RM	M	RM	M	Diff	RM	M	Diff
		ppm[d]			ppm[d]			%[d]	%[d]	mass/GCV			mass/GCV		
1*	4-24-84 1618-1638	563.5	520	43.5											
2	4-25-84 1255-1315	2663	2640	23											
3	4-25-84 1339-1359	2461	2560	99											
4															
5															
6															
7															
8															
9															
10															
11															
12															
Average		1896	1907	55.17											
Confidence Interval				97.68											
Accuracy[c]		8.06													

[a] For steam generators [b] Average of 3 samples [c] Use average of reference method test results for R.V.

[d] Make sure that RM and M data are on a consistent basis, either wet or dry

Relative accuracy determination

* Unable to calculate on lb/mbtu because no corresponding orsat data for O_2.

APPENDIX B.3

INSTRUMENT ZERO AND CALIBRATION DRIFT DETERMINATION

RSC DMB

O_2

Data set no.	Date	Time		Zero Rdg		Zero drift	Hi-level Rdg		Span drift	Calib. drift
		Begin	End	Init. A	Fin. B	C=B-A	Init. D	Fin. E	F=E-D	G=F-C
1	8/2	1000	1200	0	0.3	0.3	9.0	9.2	0.2	-0.1
2	8/2	1200	1400	0	0	0	9.0	8.9	-0.1	-0.1
3	8/2	1400	1615	0	0.1	0.1	9.0	9.1	0.1	0
4	8/2	1615	1705	0	0.2	0.2	9.0	9.05	0.05	-0.15
5	8/3	948	1156	0	0.3	0.3	9.0	9.25	0.25	-0.05
6	8/3	1156	1346	0	0.1	0.1	9.0	9.1	0.1	0
7	8/3	1346	1604	0	0.25	0.25	9.0	9.2	0.2	-0.05
8	8/3	1604	1710	0	0.15	0.15	9.0	9.2	0.2	-0.05
9										
10										
11										
12										
13										
14										
15										
Arithmetic Mean (Eq. 2-1)						0.175				0.0625
Confidence Interval (Eq. 2-2)						0.0894				0.0433
Zero Drift[a]						0.26	Calibration drift[a]			0.11

[a] Use Equation 2-3, with span value for R.V.

Zero and Calibration Drift (2 hour)

CO - RSC DMB

Data set no.	Date	Time		Zero Rdg		Zero drift	Hi-level Rdg		Span drift	Calib. drift
		Begin	End	Init. A	Fin. B	C=B-A	Init. D	Fin. E	F=E-D	G=F-C
1	8/2	930	1200	0	0	0	400	390	-10	-10
2	8/2	1200	1355	0	0	0	395	380	-15	-15
3	8/2	1355	1605	0	0	0	400	380	-20	-20
4	8/2	1605	1705	0	0	0	400	380	-20	-20
5	8/3	918	1147	0	2	2	400	395	-5	-7
6	8/3	1147	1346	0	-5	-5	400	390	-10	-5
7	8/3	1346	1604	0	0	0	410	390	-20	-20
8	8/3	1604	1710	0	0	0	400	385	-15	-15
9										
10										
11										
12										
13										
14										
15										
Arithmetic Mean (Eq. 2-1)						0.875				14.0
Confidence Interval (Eq. 2-2)						1.5115				5.057
Zero Drift[a]						0.597			Calibration drift[a]	4.76

---

[a] Use Equation 2-3, with span value for R.V.

Zero and Calibration Drift (2 hour)

NO_x - RSC DMB

Data set no.	Date	Time		Zero Rdg		Zero drift	Hi-level Rdg		Span drift	Calib. drift
		Begin	End	Init. A	Fin. B	C=B-A	Init. D	Fin. E	F=E-D	G=F-C
1	8-2-83	930	1200	0	0	0	511	514	3	3
2	8-2-83	1200	1355	0	-3.0	-3	511	511	0	3
3	8-2-83	1355	1610	0	0	0	511	510	-1	-1
4	8-2-83	1610	1705	0	0	0	511	491	-10	-10
5	8-3	948	1147	0	0	0	511	510	-1	-1
6	8-3	1147	1346	0	2	2	511	514	3	1
7	8-3	1346	1604	0	0	0	510	510	0	0
8	8-3	1604	1710	0	-3	-3	510	509	-1	2
9										
10										
11										
12										
13										
14										
15										
Arithmetic Mean (Eq. 2-1)						1.0				3.875
Confidence Interval (Eq. 2-2)						1.1825				2.6419
Zero Drift[a]						0.43			Calibration drift[a]	1.28

---

[a] Use Equation 2-3, with span value for R.V.

Zero and Calibration Drift (2 hour)

CO$_2$ - RSC DMB

Data set no.	Date	Time		Zero Rdg		Zero drift	Hi-level Rdg		Span drift	Calib. drift
		Begin	End	Init. A	Fin. B	C=B-A	Init. D	Fin. E.	F=E-D	G=F-C
1	8-2-83	930	1200	0	0.10	0.1	10.0	9.8	-0.2	-0.3
2		1200	1355	0	0.12	0.12	10.0	9.9	-0.1	-0.22
3		1355	1604	0	0	0	10.0	10.0	0	0
4		1604	1705	0	0.04	0.04	10.0	9.9	-0.1	-0.14
5	8-3-83	948	1147	0	-0.10	-0.10	10.0	10.0	0	+0.10
6	8-3-83	1147	1346	0	0.02	0.02	10.0	9.9	-0.1	-0.12
7	8-3-83	1346	1604	0	0.10	0.10	10.0	10.1	0.1	0
8	8-3	1604	1710	0	-0.10	-0.10	10.0	10.0	0	0.10
9										
10										
11										
12										
13										
14										
15										
Arithmetic Mean (Eq. 2-1)						0.0725				0.1225
Confidence Interval (Eq. 2-2)						0.0379				0.6850
Zero Drift[a]						0.11		Calibration drift[a]		0.21

0.4%

[a] Use Equation 2-3, with span value for R.V.

Zero and Calibration Drift (2 hour)

SO2-RSC DMB

Data set no.	Date	Time		Zero Rdg		Zero drift	Hi-level Rdg		Span drift	Calib. drift
		Begin	End	Init. A	Fin. B	C=B-A	Init. D	Fin. E	F=E-D	G=F-C
1	8-2	1100	1200	0	0	0	827	827	0	0
2	8.2	1210	1410	0	0	0	827	827	0	0
3	8.2	1410	1604	0	-10.0	-10	827	827	0	10
4	8.2	1604	1705	0	0	0	827	827	0	0
5	8-3	1035	1205	0	10	10	827	836	9	1
6	8-3	1205	1356	0	-2	-2	827	820	-7	5
7	8.3	1356	1610	0	0	0	827	830	3	3
8	8.3	1610	1710	0	0	0	827	820	-7	-7
9										
10										
11										
12										
13										
14										
15										
Arithmetic Mean (Eq. 2-1)						2.75			3.25	3.25
Confidence Interval (Eq. 2-2)						3.786				3.1525
Zero Drift[a]						0.79			Calibration drift[a]	0.774

---

[a] Use Equation 2-3, with span value for R.V.

Zero and Calibration Drift (2 hour)

O_2 - CCV / FLARE

Data set no.	Date	Time		Zero Rdg		Zero drift	Hi-level Rdg		Span drift	Calib. drift
		Begin	End	Init. A	Fin. B	C=B-A	Init. D	Fin. E.	F=E-D	G=F-C
1	4-6-84	859	1110	0	0	0	9.0	9.0	0	0
2	4-6-84	1110	1323	0	0.05	0.05	9.0	9.0	0	-0.05
3	4-6-84	1323	1535	0	0	0	9.0	9.0	0	0
4	4-8-84	753	1013	0	0	0	9.0	9.0	0	0
5	4-8-84	1013	1142	0	0	0	9.0	9.0	0	0
6	4-8-84	1142	1420	0	0	0	9.0	9.0	0	0
7	4-8-84	1420	1600	0	0.05	0.05	9.0	9.0	0	-0.05
8	4-8-84	1600	1853	0	0.02	0.02	9.0	9.0	0	-0.02
9	4-11-84	905	1051	0	0	0	9.0	9.0	0	0
10	4-11-84	1051	1302	0	0	0	9.0	9.0	0	0
11	4-11-84	1302	1535	0	0	0	9.0	9.0	0	0
12	4-11-84	1535	1754	0	0	0	9.0	9.0	0	0
13	4-18-84	753	949	0	0	0	9.0	9.0	0	0
14	4-18-84	949	1220	0	0	0	9.0	9.0	0	0
15	4-18-84	1220	1422	0	0	0	9.0	9.0	0	0
Arithmetic Mean (Eq. 2-1)						0.0080				0.0080
Confidence Interval (Eq. 2-2)						0.0099				0.0099
Zero Drift[a]						0.198	Calibration drift[a]			0.198

---

[a] Use Equation 2-3, with span value for R.V.

Zero and Calibration Drift (2 hour)

Span = 9.0

CO - CCV / FLARE

Data set no.	Date	Time		Zero Rdg		Zero drift	Hi-level Rdg		Span drift	Calib. drift
		Begin	End	Init. A	Fin. B	C=B-A	Init. D	Fin. E	F=E-D	G=F-C
1	4-6-84	859	1110	0	5	5	250	260	10	5
2	4-6-84	1110	1323	0	0	0	250	250	0	0
3	4-6-84	1323	1535	0	0	0	250	250	0	0
4	4-8-84	753	1013	0	1	1	250	250	0	-1
5	4-8-84	1013	1142	0	1	1	250	250	0	-1
6	4-8-84	1142	1420	0	2	2	250	290	40	38
7	4-8-84	1420	1600	0	0	0	250	250	0	0
8	4-8-84	1600	1853	0	0	0	250	250	0	0
9	4-11-84	0905	1051	0	5	5	250	250	0	-5
10	4-11-84	1051	1302	0	0	0	250	250	0	0
11	4-11-84	1302	1535	0	0	0	250	250	0	0
12	4-11-84	1535	1754	0	0	0	250	250	0	0
13	4-18-84	753	949	0	3	3	250	250	0	-3
14	4-18-84	949	1220	0	0	0	250	294	6	6
15	4-18-84	1220	1422	0	0	0	250	250	0	0
Arithmetic Mean (Eq. 2-1)						1.1333				3.9333
Confidence Interval (Eq. 2-2)						1.0010				5.3552
Zero Drift[a]						0.854			Calibration drift[a]	3.72

[a] Use Equation 2-3, with span value for R.V.

Zero and Calibration Drift (2 hour)

CO span = 250 ppm

NOx - CCV / FLARE

Data set no.	Date	Time Begin	Time End	Zero Rdg Init. A	Zero Rdg Fin. B	Zero drift C=B-A	Hi-level Rdg Init. D	Hi-level Rdg Fin. E	Span drift F=E-D	Calib. drift G=F-C
1	4-6-84	859	1110	0	0	0	794	794	0	0
2	4-6-84	1110	1323	0	0	0	794	794	0	0
3	4-6-84	1323	1535	0	0	0	794	794	0	0
4	4-8-84	753	1013	0	0	0	794	810	16	16
5	4-8-84	1013	1142	0	0	0	794	800	6	6
6	4-8-84	1142	1420	0	0	0	794	794	0	0
7	4-8-84	1421	1600	0	0	0	794	794	0	0
8	4-8-84	1600	1853	0	0	0	794	794	0	0
9	4-11-84	905	1051	0	0	0	794	840	46	46
10	4-11-84	1051	1302	0	0	0	794	830	36	36
11	4-11-84	1302	1535	0	0	0	794	800	6	6
12	4-11-84	1535	1754	0	0	0	794	800	6	6
13	4-18-84	753	949	0	0	0	794	792	-2	-2
14	4-18-84	949	1220	0	6	6	794	796	2	-4
15	4-18-84	1220	1422	0	0	0	794	794	0	0
Arithmetic Mean (Eq. 2-1)						0.4000				8.1333
Confidence Interval (Eq. 2-2)						0.8580				7.8377
Zero Drift[a]						0.158	Calibration drift[a]			2.01

---

[a] Use Equation 2-3, with span value for R.V.

Figure 2-5 Zero and Calibration Drift (2 hour)

CO_2 - CCV / FLARE

Data set no.	Date	Time Begin	Time End	Zero Rdg Init. A	Zero Rdg Fin. B	Zero drift C=B-A	Hi-level Rdg Init. D	Hi-level Rdg Fin. E	Span drift F=E-D	Calib. drift G=F-C
1	4-11-84	905	1051	0	0.04	0.04	15.0	15.0	0	-0.04
2	4-11-84	1051	1302	0	0.02	0.02	15.0	15.0	0	-0.02
3	4-11-84	1302	1535	0	0	0	15.0	15.0	0	0
4	4-11-84	15.35	1954	0	0	0	15.0	14.88	-0.12	0.12
5	4-18-84	753	949	0	0	0	15.0	15.02	0.02	0.02
6	4-18-84	949	1220	0	0	0	15.0	15.0	0	0
7	4-18-84	1220	1422	0	0	0	15.0	15.0	0	0
8	4-18-84	1422	1609	0	0	0	15.0	15.0	0	0
9	4-18-84	1609	1952	0	0	0	15.0	14.96	-0.04	-0.04
10	4-20-84	700	822	0	0.1	0.1	15.0	15.0	0.0	-0.1
11	4-20-84	822	1003	0	0.06	0.06	15.0	15.0	0	-0.06
12	4-20-84	1003	1222	0	0	0	15.0	15.0	0	0
13	4-20-84	1222	1507	0	0	0	15.0	15.0	0	0
14	4-24-84	810	1003	0	0.02	0.02	15.0	14.96	-0.04	-0.06
15	4-24-84	1003	1212	0	0.02	0.02	15.0	15.0	0	-0.02
Arithmetic Mean (Eq. 2-1)						0.0173				0.0320
Confidence Interval (Eq. 2-2)						0.0161				0.0213
Zero Drift[a]						0.223		Calibration drift[a]		0.3551

[a] Use Equation 2-3, with span value for R.V.

Figure [illegible]. Zero and Calibration Drift (2 hour)

CO_2 = 15.0

SO_2 - CCV/FLARE

Data set no.	Date	Time		Zero Rdg		Zero drift	Hi-level Rdg		Span drift	Calib. drift
		Begin	End	Init. A	Fin. B	C=B-A	Init. D	Fin. E	F=E-D	G=F-C
1	4-4-84	1303	1540	0	14.0	14	1800	1802	2	-12
2	4-4-84	1540	1712	0	0	0	1800	1796	-4	-4
3	4-5-84	1142	1405	0	-20	-20	1800	1756	-44	-24
4	4-5-84	1405	1508	0	10	10	1800	1796	-4	-14
5	4-5-84	1508	1704	0	-4	-4	1800	1812	12	16
6	4-11-84	1302	1535	0	0	0	1800	1800	0	0
7	4-11-84	1535	1754	0	0	0	1800	1810	10	10
8	4-18-84	949	1220	0	6	6	1800	1780	-20	-26
9	4-18-84	1220	1422	0	-14	-14	1800	1800	0	14
10	4-18-84	1422	1609	0	-2	-2	1800	1800	0	2
11	4-20-84	822	1003	0	-40	-40	1800	1820	20	60
12	4-20-84	1003	1222	0	-10	-10	1800	1800	0	10
13	4-20-84	1222	1507	0	0	0	1800	1600	0	0
14	4-24-84	1003	1212	0	8	8	1800	1800	0	-8
15	4-24-84	1212	1448	0	12	12	1800	1790	-10	-22
Arithmetic Mean (Eq. 2-1)						9.3333				14.8000
Confidence Interval (Eq. 2-2)						5.8263				8.2764
Zero Drift[a]						0.8422	Calibration drift[a]			1.28

[a] Use Equation 2-3, with span value for R.V.

Zero and Calibration Drift (2 hour)

SO_2 span - 1800

APPENDIX B.4

DATA CALCULATION SHEETS

RSC DMB- PARTICULATE MASS LOADING
and SO_2 CALCULATIONS

	8-1-83	223A 8-2-83	22.3B 8-2-83	8-3 23.3A	8-3 23.3B	
Barometric Pressure: P_{bar} (In. Hg.)	30.0	29.60	29.60	30.10	30.10	
Static Pressure: P_g (in. H_2O)	+1.0	+1.0	+1.0	+1.0	+1.0	
Area of Stack: A (ft^2)	28.274	28.274	-	28.274	28.274	
Pitot Coefficient: C_p	0.84	0.84	-	.84	.84	
Meter Calibration Factor: Y	1.0	1.0	-	1.0	1.0	
Area of Nozzle: A_n (in^2)	0.1963	0.1104	0.1104	.1104	.1104	
Total Sampling Time: Θ (Min.)	9	24	24	24	24	
Gas Sample Volume: Vm (ft^3) 4.912	3.511*	12.826	13.935	13.465	12.708	
Avg. Velocity Head: $(\sqrt{\Delta p})^2$avg. (in. H_2O)	0.04	0.163	0.159	~~.1649~~ 0.1810	~~.1804874~~ 0.1640	
Avg. Orifice Pressure: ΔH (in H_2O)	0.96	1.25	1.28	1.24	1.12	
Avg. Stack Temperature: T_s (°R)	1500	1698	1739	1746	1722 ~~1362.25~~	
Avg. Meter Temperature: T_m (°R)	555	559	559	559.79	557.91	
Gas Sample Volume @ Std. Cond.: Vm(Std) (ft^3) = $\frac{17.64\ VmY}{Tm}$ (P_{bar} +ΔH/13.6) 4.695	3.356	12.018	13.058	12.811 ~~[illegible]~~	12.127	
Volume of Liquid and Silica Gel Collected: V_{1c} (ml.)	14	31	31	35.9	38.6	
Volume of Water Vapor: Vw (Std) (ft^3) = 0.04707 V_{1c}	0.6590	1.459	1.459	1.690	1.817	
Moisture Content: $B_{ws} = \frac{V_w\ (Std)}{Vm(Std) + Vw(Std)}$	.1231 (16.41)	0.108	0.101	0.1165 ~~.1218~~	.1302	
Molecular Weight of Stack Gas (dry): M_d = 0.44 (% CO_2) + 0.32 (% O_2) + 0.28 (% N_2+% CO) CO_2 = 15.6 O_2 = 3.4 N_2 = 81 CO_2 15.4 O_2 3.4 N_2 81.2	30.63	30.60	30.60	30.42 ~~30.60~~	3059	

* Not total volume. For isokinetic calculation only.

CO_2-15.4
3.0 → O_2 ~~3.5~~
N-81.1

CO_2-15.2
O_2 3.8
N-81

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3 OF 3

PB86
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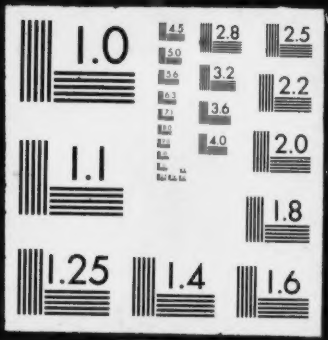

1.0
4.5
5.0
5.6
6.3
7.1
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

Molecular Weight of Stack Gas (wet): $M_s = M_d\ (1-B_{ws}) + 18.0\ B_{ws}$	29.37	29.24	29.33	28.97 ~~29.13~~	28.95	
Stack Pressure: P_s (in. Hg) = $P_{bar} + P_g/13.6$	30.07	29.67	29.67	30.17	30.17	
Stack Gas Velocity: v_s (ft/sec) = $85.49\ C_p\ (\Delta P T_s/P_s M_s)^{1/2}$	18.72	40.56	40.48	43.06	40.83	
Stack Gas Volume Flow Rate: Q_{sd} (dscf/min) = $1059\ (1-B_{ws})\ V_s A P_s/T_s$	9,853	18,930	18,591	19683	18626	
Actual Stack Gas Volume Flow Rate: Q (acf/min) = $60\ v_s\ A$	31,757	68,810	68,672	73049	69266	
Weight of Particulate Collected: m_n (mg.)	1433.96	2727.4	2036.2	3341.2	4021.13	
Concentration of Particulate @ Std.Cond.(dry): C_s(gr/scf) = $0.01542\ m_n/V_m$ (std) C_s(g/dscm) = $0.03529\ m_n/V_m$ (std)	4.7096	3.4995	2.4045	4.0216	5.1130	
Mass Flow Rate of Particulate: Q (lb/hr) = $0.008571\ C_s\ Q_{sd}$	397.73	567.18	383.14	678.5	816.35	
Isokinetic Rate: I (%) = $13.61\ T_s\ V_m (std)/P_s\ v_s A_n\ \Theta\ (1-B_{ws})$	76.5	97.6	108.0	100.10	100.12	

RSC-DMB

SUMMARY OF RESULTS

SO_2

Date	Sampling Location	Run No.	Corrected Sample Volume: V_{mstd} (ft^3)	Titrant Volume: V_t (ml)	Total Solution Volume: V_{soln} (ml)	Aliquot Volume: Va (ml)	Titrant Normality: N	SO_2 Concentration C_{SO_2} (lbs/ft)	SO_2 Concentration C_{SO_2} (ppm)
8-1-83	LWS Exhaust	21.1A	4.695	2.03	500	2	0.011	8.3130×10^{-5}	499.8
8-2-83	LWS Exhaust	22.3A	12.018	14.90	500	5	0.011	9.6168×10^{-5}	578.22
8-2-83	LWS Exhaust	22.3B	13.058	6.20	500	2	0.011	9.1899×10^{-5}	552.5
8-3-83	LWS Exhaust	23.3A*	12.81	4.69	500	2	0.011	7.0183×10^{-5}	422.0
8-3-83	LWS Exhaust	23.3B	12.12	4.17	500	2	0.011	6.6488×10^{-5}	399.8

$$C_{SO_2} \text{ lb/ft} = \frac{(7.061 \times 10^{-5})\, N\, (V_t - V_{tb})\, (V_{soln}/V_a)}{V_{m_{std}}}$$

V_{TB} = .02 mL

* V_{TB} = 0.06

$$C_{SO_2} \text{ ppm} = (C_{SO_2} \text{ lb/ft}^3)\,(384.8 \text{ ft}^3\text{/mole})\,(1 \text{ mole/64 lbs})\, 10^6$$

RSC-DMB SO_3 RESULTS

TEST	21.14	223A	223B	22.3C	23.3A	23.3B
TIME	1528-1558	1232-1252	1355-1425	1515-1545	1258-1328	1457-1601
DATE	8/1/83	8/2	8/2	8/2	8/3	8/3
Barometric Pressure: P_{bar} (In. Hg.)	30.60	29.60	29.60	29.60	30.10	30.10
Static Pressure: P_g (in. H_2O)	—	—	—	—	—	—
Area of Stack: A (ft^2)	—	—	—	—	—	—
Pitot Coefficient: C_p	—	—	—	—	—	—
Meter Calibration Factor: Y	1.0	1.0	1.0	1.0	1.0	1.0
Area of Nozzle: A_n (in^2)	—	—	—	—	—	—
Total Sampling Time: Θ (Min.)	30	20	30	30	30	30
Gas Sample Volume: Vm (ft^3)	8.668	5.729	8.788	8.131	9.848	8.583
Avg. Velocity Head: $(\sqrt{\Delta p})^2$avg. (in. H_2O)	—	—	—	—	—	—
Avg. Orifice Pressure: ΔH (in H_2O)	0	0	0	0	0	0
Avg. Stack Temperature: T_s (°R)	—	—	—	—	—	—
Avg. Meter Temperature: T_m (°R)	541.5	547.2	549.3	549.4	550.3	548.3
Gas Sample Volume @ Std. Cond.: $Vm(Std)\ (ft^3) = \frac{17.64\ VmY}{Tm}\ (P_{bar} + \Delta H/13.6)$	8.4711	5.467	8.354	7.728	9.502	8.312
Volume of Liquid and Silica Gel Collected: V_{1c} (ml.)						
Volume of Water Vapor: $Vw\ (Std)\ (ft^3) = 0.04707\ V_{1c}$						
Moisture Content: $B_{ws} = \frac{V_w\ (Std)}{Vm(Std) + Vw(Std)}$						
Molecular Weight of Stack Gas (dry): $M_d = 0.44\ (\%\ CO_2) + 0.32\ (\%\ O_2) + 0.28\ (\%\ N_2 + \%\ CO)$						

SUMMARY OF RESULTS

SO_3 AS H_2SO_4

RSC DMB SO_3 RESULTS

	Date	Sampling Location	Run No.	Corrected Sample Volume: V_{mStd} (ft³)	Titrant Volume: Vt(ml)	Total Solution Volume: V_{Soln} (ml)	Aliquot Volume: Va(ml)	Titrant Normality: N	SO_3 Concentration $C_{H_2SO_4}$ (lbs)ft³ as H_2SO_4)	SO_3 Concentration: $C_{H_2SO_4}$ (ppm)
1328-1558	8/11/83	LWS-Exhaust	21.14	8.4711	0.30	50	50	0.011	3.9304×10^{-8}	0.1543
1232-1252	8/2/83	LWS-Exhaust	22.3A	5.467	0.40	50	50	0.011	8.2652×10^{-8}	0.3245
1355-1425	8/2/83	LWS-Exhaust	22.3BC	8.354	1.32	50	50	0.011	1.8504×10^{-7}	0.7266
1515-1545	8/2/83	LWS-Exhaust	22.3 4E	7.728	0.98	50	50	0.011	1.5079×10^{-7}	0.5921
1258-1328	8/3/83	LWS-Exhaust	23.3A	9.502	0.36	50	50	0.011	4.2548×10^{-8}	0.1671
1457-1601	8/3/83	LWS-Exhaust	23.3D	8.312	0.19	50	50	0.011	2.4320×10^{-8}	0.0989

$$C_{H_2SO_4} \quad lb/ft^3 \quad = \quad \frac{(1.081 \times 10^{-4})\ N\ (V_t - V_{tb})(V'_{soln}/V_a)}{V_{m_{std}}}$$

$V_{TB} = 0.02\,ml$

$$C_{H_2SO_4} \quad ppm \quad = \quad (C_{H_2SO_4}\ lb/ft^3)(384.8\ \frac{ft^3}{mole})(^1 mole/98\ lbs)\ 10^6$$

CCVIFLARE SO_2 SAMPLE ANALYIS

	Run 2 Test 9.12 4-25-84	Run 3 Test 9.13 4-25-84	Run 1 Test 8.17 4-24-84			
Barometric Pressure: P_{bar} (In. Hg.)	29.45	29.45	29.34			
Static Pressure: P_g (in. H_2O)	—	—	—			
Area of Stack: A (ft^2)	28.274	28.274	28.274			
Pitot Coefficient: C_p	–	—	—			
Meter Calibration Factor: Y	1.0	1.0	1.0			
Area of Nozzle: A_n (in^2)	0.5	0.5	0.5			
Total Sampling Time: θ (Min.)	20	20	20			
Gas Sample Volume: Vm (ft^3)	18.1170	18.288	17.28			
Avg. Velocity Head: $(\sqrt{\Delta p})^2$avg. (in. H_2O)	0	0	0			
Avg. Orifice Pressure: ΔH (in H_2O)	3"	3"	2.78"			
Avg. Stack Temperature: T_s (°R)	1705.6	1699.2	1752.6			
Avg. Meter Temperature: T_m (°R)	544.6	548.6	538.4			
Gas Sample Volume @ Std. Cond.: $Vm(Std)\ (ft^3) = \frac{17.64\ VmY}{Tm}\ (P_{bar} + \Delta H/13.6)$	17.4274	17.4476	16.72268			
Volume of Liquid and Silica Gel Collected: V_{1c} (ml.)	70.81	70.12	57.54			
Volume of Water Vapor: $Vw\ (Std)\ (ft^3) = 0.04707\ V_{1c}$	3.333	3.30	2.7084			
Moisture Content: $B_{ws} = \frac{V_w\ (Std)}{Vm(Std) + Vw(Std)}$	0.1605	.1591	0.1394			
Molecular Weight of Stack Gas (dry): $M_d = 0.44\ (\%\ CO_2) + 0.32\ (\%\ O_2) + 0.28\ (\%\ N_2 + \%\ CO)$						

CCV / FLARE SO_2 CALCULATIONS
(1 of 2)

SUMMARY OF RESULTS

SO_2

Blanks: 0.06 ml
0.06 ml

Date	Sampling Location	Run No.	Corrected Sample Volume: V_{mstd} (ft³)	Titrant Volume: V_t (ml)	Total Solution Volume: V_{soln} (ml)	Aliquot Volume: Va (ml)	Titrant Normality: N	SO_2 Concentration C_{SO_2} (lbs/ft)	SO_2 Concentration C_{SO_2} (ppm)
4/26/84	104589	9.12 #2		11.08	500	0.5	0.01		
	repeat			10.90	500	0.5	0.01		
			17.4274	$\bar{x}$ = 10.99				4.4285×10^{-4}	2662.62
4/26/84	104590	9.13 #3		10.14	500	0.5	0.01)	Blank = 0.05	
	repeat			10.19	500	0.5	0.01 }	4.0935×10^{-4}	2461.2
				$\bar{x}$ = 10.165					
			17.4476						
					.05 blank				

$$C_{SO_2} \ \text{lb/ft} = \frac{(7.061\times10^{-5})\ N\ (V_t - V_{tb})\ (V_{soln}/V_a)}{V_{m_{std}}}$$

$$C_{SO_2} \ \text{ppm} = (C_{SO_2} \ \text{lb/ft}^3)\ (384.8 \ \text{ft}^3/\text{mole})\ (1 \ \text{mole}/64 \ \text{lbs})\ 10^6$$

CCV/FLARE SO_2 CALCULATIONS
(2 of 2)

SUMMARY OF RESULTS

SO_2

Blanks: 0.04ml
0.04ml
0.04ml

Date	Sampling Location	Run No.	Corrected Sample Volume: V_{mstd} (ft^3)	Titrant Volume: V_t (ml)	Total Solution Volume: V_{soln} (ml)	Aliquot Volume: Va (ml)	Titrant Normality: N	SO_2 Concentration C_{SO_2} (lbs/ft)	SO_2 Concentration C_{SO_2} (ppm), dry
4/25/84	LWS 104575		16.7268	8.82	500	2	0.01		
	repeat			9.00	500	2	0.01		
	repeat			9.02	500	2	0.01		
	repeat			8.84	500	2	0.01		
	repeat			$\bar{x}$: 8.92				9.371×10^{-5}	563.46

$$C_{SO_2}\ \text{lb/ft} = \frac{(7.061\times10^{-5})\ N\ (V_t - V_{tb})\ (V_{soln}/V_a)}{V_{m_{std}}}$$

$$C_{SO_2}\ \text{ppm} = (C_{SO_2}\ \text{lb/ft}^3)\ (384.8\ \text{ft}^3/\text{mole})\ (1\ \text{mole}/64\ \text{lbs})\ 10^6$$

APPENDIX C

RSC DMB TEST DATA

This appendix includes all valid test data obtained during the first phase of the test program, optimization and evaluation of RSC DMB. The data presented are computer listings of the data with the headings at the top of the page describing the formatted numbers below. The formatting of the data was designed for use by the test engineer to present all data characterizing each test condition as completely as possible. This results in a very dense packing of information and much abbreviation. Figure C-1 is a sample output data sheet from phase 2, the formated data are described as follows:

A) TER DIA - Three tertiary air port diameters were tested 8", 10", and 12". This item denotes which was in use for that test day.

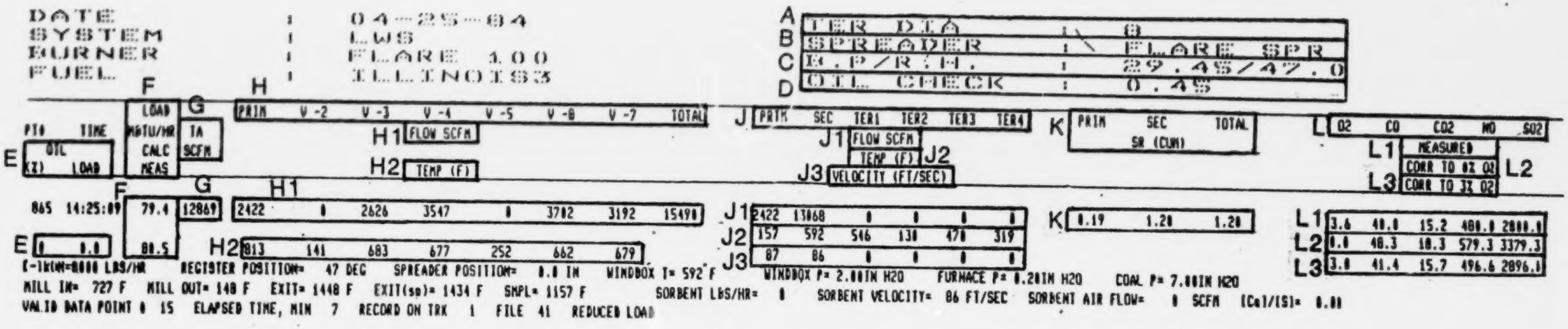
B) SPREADER - A variety of coal spreaders were used during this test program. The coal spreader description and notation are as follows:

Venturi Nozzle Design

- BL-CONE: Original conical CCV burner coal spreader (Fig. 2-4),
- 4" - 4 @ 15: 4" straight coal spreader with 4 "long" vanes at 15° (Fig. 2-5), (phase 1 only)
- 4" - 4 @ 20: 4" straight coal spreader with 4 "short" vanes at 28° (Fig. 2-5), (phase 1),
- 4" - 4 @ 28: 4" straight coal spreader with 4 "short" vanes at 28° (Fig. 2-5), (phase 2, 4-11-84 only)
- 4" - 4 @ 28: 4" straight coal spreader with 4 "long" vanes at 28° (Fig. 2-5), (phase 2 only)

Straight Nozzle Design (phase 2 only)

- FLARE SPR: High swirl impeller,


A
B
C
D
E
F
G
H
H1
H2
J
J1
J2
J3
K
L
L1
L2
L3

```
DATE                 :   04-25-84                  TER DIA      :   0
SYSTEM               :   LWS                       SPREADER     :   FLARE SPR
BURNER               :   FLARE 100                 B.P/R.H.     :   29.45/47.0
FUEL                 :   ILLINOIS3                 OIL CHECK    :   0.45

PT0    TIME    LOAD    TA    PRIM  V -2  V -3  V -4  V -5  V -6  V -7  TOTAL   PRIM  SEC  TER1 TER2 TER3 TER4   PRIM  SEC  TOTAL   O2   CO   CO2  NO  SO2
               MBTU/HR SCFM               FLOW SCFM                            FLOW SCFM                           SR (CUM)        MEASURED
 OIL           CALC                       TEMP (F)                             TEMP (F)                                            CORR TO 0% O2
(%)    LOAD    MEAS                                                            VELOCITY (FT/SEC)                                   CORR TO 3% O2

065 14:25:09   79.4   12869  2422   0    2626  3547   0   3702  3192  15490   2422 13068  0    0    0    0      0.19  1.20  1.20   3.6  40.0 15.2 480.0 2800.0
0      0.0     80.5          813   141   683   677   252   662   679          157   592  546  130  470  319                        0.0  48.3 18.3 579.3 3379.3
                                                                               87    86    0    0    0    0                        3.0  41.4 15.7 496.6 2896.0
C-1KLM=0000 LBS/HR    REGISTER POSITION=   47 DEG    SPREADER POSITION=   0.0 IN    WINDBOX T= 592 F    WINDBOX P= 2.00IN H2O    FURNACE P= 0.20IN H2O    COAL P= 7.00IN H2O
MILL IN=  727 F   MILL OUT= 140 F   EXIT= 1440 F   EXIT(sp)= 1434 F   SMPL= 1157 F         SORBENT LBS/HR=   0    SORBENT VELOCITY=  86 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  15   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  41   REDUCED LOAD
```

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Figure C-1 Sample Computer Output Sheet From Phase 2.

C) B.P./R.H. - Barometric Pressure, "Hg", and Relative Humidity.

D) OIL CHECK - represents the standard procedure of closing an oxygen balance while firing a measured oil flow compared to the firing rate calculated based on oil composition, measured O_2 in the flue gas, and measured air flow with venturi flowmeters. The value of 0.45 for the data shown signifies that the O_2 balance was within 0.45 percent. The maximum deviation acceptable to continue testing is 10 percent. This procedure is described further in Appendix A. In phase 1 this number is reported relative to 100% rather than 0%.

E) Item E, "OIL, %, LOAD." is used only when oil is fired during startup. "OIL %" is the reading from a calibrated oil rotameter in percent of full scale. "OIL LOAD" is the firing rate calculated from the rotameter reading in 10^6 Btu/hr.

F) LOAD - This denotes the furnace load as heat input in 10^6 Btu/hr. The top value CALC is calculated based on an O_2 balance and is the number used to set load. For comparison the measured heat input, MEAS, based on the measured oil or coal flow is also displayed.

G) "TA SCFM" represents the theoretical air requirement in scfm for stoichiometric combustion at the calculated firing rate.

H) Item H lists the venturis for measuring air flow to the burner. PRIM represents the primary air venturi. In Phase 1: venturis designated as V-2 and V-3 supply the inner secondary air windbox and venturis V-4 and V-5 supply the outer secondary air windbox; venturis V-6, V-7, V-8, and V-9 supply the tertiary air ports. In Phase 2: venturis designated as V-2, and V-3, supply the burner windbox; venturis V-4, V-5, V-6, and V-7 supply the tertiary air ports.

H1) Item H1 lists the air flow in SCFM through each venturi.

H2) Item H2 lists the air temperature in each venturi in degrees farenheit.

J) Item J lists the burner passages admitting air to the furnace.

J1) Item J1 lists the air flow through each burner passage in SCFM as calculated from the venturi flows described in items H and H1.

J2) Item J2 lists the air temperatures in each burner passage measured at the burner in degrees F.

J3) Item J3 lists the air velocities at the burner passage exits based on items J1 and J2.

K) Item K lists the stoichiometric ratio (SR) for each burner passage. These are listed cumulatively, which means that the fractional stoichiometric air from each passage is added to yield an overall stoichiometry for each zone.

L) Item L presents the emissions measured by the continuous monitors and include O_2, CO, CO_2, NO as NO_x, and SO_2. SO_2 was also measured using a DuPont analyzer in Phase I.

L1) Item L1 lists the as measured values of O_2, CO_2, CO, NO_x, and SO_2, on a dry basis.

L2) Item L2 lists the flue gas analysis corrected to 0% O_2.

L3) Item L3 lists the flue gas analysis corrected to 3% O_2.

```
DATE          :    06-28-83                             TER DIA        :    12
SYSTEM        :    LWS                                  SPREADER       :    BL   CONE
BURNER        :    RSC  DMB                             R.H./B.P.      :    FJ
FUEL          :    UTAHS                                OIL  CHECK     :    98.9

                  LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4   PRIM  SEC1  SEC2  TOTAL   O2    CO    CO2   NO    SO2  DUPONT
PT#   TIME     MBTU/HR  TA                                FLOW SCFM                                              FLOW SCFM                      SR (CUM)                             MEASURED
  OIL             CALC  SCFM                                                                  TEMP (F)              CORR TO 0% O2
(%)   LOAD        MEAS                                    TEMP (F)                                         VELOCITY (FT/SEC)                                                   CORR TO 3% O2

451  13:11:09    95.9 16331 3152   718   301   821  1118  3826  3793  4441  3927 22097     3292  7902  7747   718   301   821  1118   0.20  0.81  1.29  1.36    5.6  35.0  13.2 250.0   0.0   0.0
                                                                                            124   596   600   509   535   453   563                            0.0  47.7  18.0 340.9   0.0   0.0
                                                                                             99   104    98    28    12    30    46                            3.0  40.9  15.4 292.2   0.0   0.0
  0    0.0     110.9            234   648   661   650   661   723   724   707   713
  NOZZLE =   0 in   SPREADER =   0 in   IN REG =  25 DEG   OUT REG =  25 DEG   P WB(in) = 2.70in H20   P WB(out) = 2.30in H20   DP(in) = 0.00in H20   DP(out) = 0.00in H20   FURN P = 0.10in H20   COAL P = 1.10in H20
  MILL=  176 F   EXIT= 1365 F   EXIT(sp)= 1678 F   SMPL= 1225 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
  VALID DATA POINT #   1   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  87

451  13:11:09    95.1 16195 3093   718   356   606  1121  3657  3652  4015  3636 20854     3292  7902  7747   718   356   606  1121   0.20  0.74  1.22  1.29    4.0  38.0  14.3 235.0   0.0   0.0
                                                                                            124   596   600   509   535   453   563                            0.0  49.3  18.5 304.6   0.0   0.0
                                                                                             99   104    98    28    14    22    46                            3.0  42.2  15.9 261.1   0.0   0.0
  0    0.0     110.9            240   655   670   650   666   733   733   717   721
  NOZZLE =   0 in   SPREADER =  -7 in   IN REG =  25 DEG   OUT REG =  25 DEG   P WB(in) = 2.70in H20   P WB(out) = 2.30in H20   DP(in) = 0.00in H20   DP(out) = 0.00in H20   FURN P = 0.10in H20   COAL P = 1.10in H20
  MILL=  176 F   EXIT= 1365 F   EXIT(sp)= 1678 F   SMPL= 1225 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
  VALID DATA POINT #   2   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  88

451  13:11:09    95.9 16325 3150   704   289   794  1115  4113  4174  4392  3787 22510     3292  7902  7747   704   289   794  1115   0.20  0.84  1.31  1.38    5.9  30.0  13.0 245.0   0.0   0.0
                                                                                            124   596   600   509   535   453   563                            0.0  41.7  18.1 340.7   0.0   0.0
                                                                                             99   104    98    27    12    29    46                            3.0  35.0  15.5 292.1   0.0   0.0
  0    0.0     110.9            232   653   665   650   666   731   731   715   721
  NOZZLE =   0 in   SPREADER =  -7 in   IN REG =  25 DEG   OUT REG =  25 DEG   P WB(in) = 2.70in H20   P WB(out) = 2.30in H20   DP(in) = 0.00in H20   DP(out) = 0.00in H20   FURN P = 0.10in H20   COAL P = 1.10in H20
  MILL=  176 F   EXIT= 1365 F   EXIT(sp)= 1678 F   SMPL= 1225 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
  VALID DATA POINT #   3   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  89

451  13:11:09    99.4 16923 3192   694   155   810  1104  4490  4685  5267  4394 24791     3292  7902  7747   694   155   810  1104   0.19  0.94  1.40  1.46    6.8  30.0  12.2 255.0   0.0   0.0
                                                                                            124   596   600   509   535   453   563                            0.0  44.4  18.0 377.1   0.0   0.0
                                                                                             99   104    98    27     6    30    45                            3.0  38.0  15.5 323.2   0.0   0.0
  0    0.0     110.9            222   629   640   650   641   703   702   691   695
  NOZZLE =   0 in   SPREADER =  -7 in   IN REG =  25 DEG   OUT REG =  25 DEG   P WB(in) = 2.70in H20   P WB(out) = 2.30in H20   DP(in) = 0.00in H20   DP(out) = 0.00in H20   FURN P = 0.10in H20   COAL P = 1.10in H20
  MILL=  176 F   EXIT= 1365 F   EXIT(sp)= 1678 F   SMPL= 1225 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
  VALID DATA POINT #   4   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  90

451  13:11:09    91.5 15575 3153   730   434   512  1128  3619  2702  3830  2491 18599     3292  7902  7747   730   434   512  1128   0.21  0.63  1.12  1.19    3.5  50.0  16.0 196.0   0.0   0.0
                                                                                            124   596   600   509   535   453   563                            0.0  60.0  19.2 235.2   0.0   0.0
                                                                                             99   104    98    28    17    19    46                            3.0  51.4  16.5 201.6   0.0   0.0
  0    0.0     110.9            243   663   679   650   675   745   744   726   724
  NOZZLE =   0 in   SPREADER =  -7 in   IN REG =  25 DEG   OUT REG =  25 DEG   P WB(in) = 2.70in H20   P WB(out) = 2.30in H20   DP(in) = 0.00in H20   DP(out) = 0.00in H20   FURN P = 0.10in H20   COAL P = 1.10in H20
  MILL=  176 F   EXIT= 1365 F   EXIT(sp)= 1678 F   SMPL= 1225 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
  VALID DATA POINT #   5   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  91
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DATE            :   06-29-83                          TER DIA        :   1.2
SYSTEM          :   LWS                               SPREADER       :   BL  CONE
BURNER          :   RSC  DMB                          R.H./B.P.      :   FJ
FUEL            :   UTAHS                             OIL  CHECK     :   98.9

           LOAD          PRIN  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIN  SEC1  SEC2  TER1  TER2  TER3  TER4   PRIN  SEC1  SEC2  TOTAL   O2    CO    CO2    NO    SO2  DUPONT
PT#   TIME  MBTU/HR  TA                  FLOW SCFM                                                 FLOW SCFM                          SR (CUM)                             MEASURED
 OIL        CALC  SCFM                                                             TEMP (F)              CORR TO 0% O2
(%)   LOAD  MEAS                           TEMP (F)                                          VELOCITY (FT/SEC)                                                      CORR TO 3% O2

451  13:11:09  100.7 15825 3292   444   663     0     0  4155  3591  4305  3596 20047   3292  7902  7747   444   663     0     0   0.21  0.71  1.20  1.27    4.5  40.0  14.2  235.0  0.0  0.0
                                                                                       124   596   600   509   535   453   563                             0.0  50.9  10.1  299.1  0.0  0.0
 0     0.0   111.7        316   662   680   669   673   728   729   715   719           99   104    98    17    26     0     0                             3.0  43.6  15.5  256.4  0.0  0.0
   NOZZLE =   0 in   SPREADER =  -7 in   IN REG =  25 DEG   OUT REG =  25 DEG   P WB(in) = 2.70in H2O   P WB(out) = 2.30in H2O   DP(in) = 0.00in H2O   DP(out) = 0.00in H2O   FURN P = 0.10in H2O   COAL P = 1.10in H2O
   MILL=  176 F   EXIT= 1365 F   EXIT(sp)= 1670 F   SMPL= 1225 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   1   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE   1

468  13:45:14   99.5 15640 3213   423   660     0     0  4194  3587  4218  3528 19823   3213  7746  7781   423   660     0     0   0.21  0.70  1.20  1.27    4.5  45.0  14.2  230.0  0.0  0.0
                                                                                       125   591   595   510   514   472   566                             0.0  57.3  10.1  292.7  0.0  0.0
 0     0.0   112.9        314   659   680   646   677   733   733   717   721           97   101    98    16    26     0     0                             3.0  49.1  15.5  250.9  0.0  0.0
   NOZZLE =   0 in   SPREADER =  -7 in   IN REG =  25 DEG   OUT REG =  25 DEG   P WB(in) = 2.40in H2O   P WB(out) = 2.30in H2O   DP(in) = 0.00in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O   COAL P = 1.10in H2O
   MILL=  170 F   EXIT= 1348 F   EXIT(sp)= 1402 F   SMPL= 1227 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   2   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE   2   IGNITOR OUT

492  14:00:12   98.5 15491 3271   430   635     0     0  4224  3567  4238  3556 19921   3271  7794  7791   430   635     0     0   0.21  0.71  1.22  1.29    4.8  35.0  14.0  225.0  0.0  0.0
                                                                                       124   582   589   494   496   450   555                             0.0  45.2  10.1  290.8  0.0  0.0
 0     0.0   111.7        304   645   668   636   666   732   732   712   724           99   101    98    16    24     0     0                             3.0  38.8  15.5  249.2  0.0  0.0
   NOZZLE =   0 in   SPREADER =  -7 in   IN REG =  25 DEG   OUT REG =  25 DEG   P WB(in) = 2.40in H2O   P WB(out) = 2.30in H2O   DP(in) = 0.00in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O   COAL P = 1.10in H2O
   MILL=  163 F   EXIT= 1365 F   EXIT(sp)= 1417 F   SMPL= 1225 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   3   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE   3   IGNITOR IN

607  14:56:00   98.7 15524 2806   655   632  1353   690  3651  3040  3278  3305 19492   2806  6664  6691   655   632  1353   690   0.18  0.61  1.04  1.26    4.4  65.0  14.2  180.0  0.0  0.0
                                                                                       124   569   577   486   534   592   613                             0.0  82.0  17.9  227.0  0.0  0.0
 0     0.0   111.7        311   664   660   986   694   727   725   703   713           85    85    83    25    25    57    30                             3.0  70.3  15.4  194.6  0.0  0.0
   NOZZLE =   0 in   SPREADER =  -7 in   IN REG =  25 DEG   OUT REG =  25 DEG   P WB(in) = 2.40in H2O   P WB(out) = 2.30in H2O   DP(in) = 0.00in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O   COAL P = 1.10in H2O
   MILL=  160 F   EXIT= 1363 F   EXIT(sp)= 1449 F   SMPL= 1208 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   4   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE   4

644  15:16:34   92.6 14552 2782  1492   870   593  1623  3350  2472  2782  2922 18886   2782  5704  5821  1492   870   593  1623   0.19  0.58  0.98  1.30    4.9  50.0  14.0  200.0  0.0  0.0
                                                                                       126   542   557   496   598   602   633                             0.0  65.2  10.3  260.9  0.0  0.0
 0     0.0   111.7        313   696   674   700   704   727   723   697   714           84    71    71    57    37    25    71                             3.0  55.9  15.7  223.6  0.0  0.0
   NOZZLE =   0 in   SPREADER =  -7 in   IN REG =  25 DEG   OUT REG =  25 DEG   P WB(in) = 2.40in H2O   P WB(out) = 2.30in H2O   DP(in) = 0.00in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O   COAL P = 1.10in H2O
   MILL=  161 F   EXIT= 1393 F   EXIT(sp)= 1690 F   SMPL= 1212 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   5   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE   5
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DATE         :    06-30-83                    TER DIA        :    12
SYSTEM       :    LWS                         SPREADER       :    4"-4015
BURNER       :    RSC DMB                     R.H./B.P.      :    FJ
FUEL         :    UTAH6                       OIL CHECK      :    98.55

            LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4     PRIM  SEC1  SEC2  TOTAL    O2    CO    CO2   NO     SO2   DUPONT
PT#   TIME  MBTU/HR  TA                               FLOW SCFM                                           FLOW SCFM                           SR (CUM)                                MEASURED
 OIL         CALC  SCFM                                                                       TEMP (F)              CORR TO 0% O2
(%)   LOAD   MEAS                                   TEMP (F)                                          VELOCITY (FT/SEC)                                                     CORR TO 3% O2

331  13:13:25   97.3 16556 2658   478   672     0     0  3894  4112  3959  4221 19994    2658  8100  8006   478   672     0     0    0.16  0.65  1.14  1.21    3.7  42.0  14.6 220.0   0.0   0.0
                                                                                          152   585   586   521   527   481   552                              0.0  51.0  17.7 267.1   0.0   0.0
  0     0.0   120.5            508   643   656   629   647   699   700   686   692          84   107   100    19    27     0     0                              3.0  43.7  15.2 228.9   0.0   0.0
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 4.60in H20   P WB(out) = 1.90in H20   DP(in) = 0.10in H20   DP(out) =-0.35in H20   FURN P =-0.01in H20   COAL P = 0.00in H20
   MILL=  156 F   EXIT= 1417 F   EXIT(sp)= 1570 F   SMPL= 1238 F         SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   1   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE   6

337  13:24:15   97.4 16574 2645   481   680     0     0  3089  4128  3980  4214 20016    2645  8193  8017   481   680     0     0    0.16  0.65  1.14  1.21    3.7  35.0  14.6 220.0   0.0   0.0
                                                                                          155   587   586   523   531   483   546                              0.0  42.5  17.7 267.1   0.0   0.0
  0     0.0   120.5            506   642   656   630   648   701   703   687   694          84   107   100    19    27     0     0                              3.0  36.4  15.2 228.9   0.0   0.0
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 4.60in H20   P WB(out) = 1.90in H20   DP(in) = 0.10in H20   DP(out) =-0.35in H20   FURN P =-0.01in H20   COAL P = 0.00in H20
   MILL=  158 F   EXIT= 1426 F   EXIT(sp)= 1761 F   SMPL= 1244 F         SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   2   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE   7

372  13:42:34   97.2 16549 2531   458   664     0     0  3906  4125  3968  4221 19873    2531  8189  8031   458   664     0     0    0.15  0.65  1.13  1.20    3.6  35.0  14.8 230.0   0.0   0.0
                                                                                          153   588   587   514   517   458   542                              0.0  42.2  17.9 277.6   0.0   0.0
  0     0.0   120.5            515   641   658   628   649   705   706   688   699          80   107   100    18    26     0     0                              3.0  36.2  15.3 237.9   0.0   0.1
   NOZZLE =  0 in   SPREADER = -6 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 4.60in H20   P WB(out) = 5.30in H20   DP(in) =-0.10in H20   DP(out) =-0.35in H20   FURN P = 0.65in H20   COAL P =10.00in H20
   MILL=  153 F   EXIT= 1415 F   EXIT(sp)= 1681 F   SMPL= 1249 F         SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   3   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  10   SPREADER RETRACTION

475  14:40:09   99.2 16888 2558   447   645     0     0  4071  4405  4087  4298 20510    2558  8384  8476   447   645     0     0    0.15  0.65  1.15  1.21    3.0  40.0  14.4 270.0   0.0   0.0
                                                                                          146   601   600   550   575   467   562                              0.0  48.8  17.6 329.7   0.0   0.0
  0     0.0   120.5            455   646   661  2243   653   709   711   696   703          80   111   107    18    27     0     0                              3.0  41.9  15.1 282.6   0.0   0.0
   NOZZLE =  0 in   SPREADER =  6 in   IN REG =  25 DEG   OUT REG =  25 DEG   P WB(in) = 3.40in H20   P WB(out) = 3.80in H20   DP(in) = 0.25in H20   DP(out) =-0.40in H20   FURN P =-0.25in H20   COAL P =10.00in H20
   MILL=  146 F   EXIT= 1466 F   EXIT(sp)= ---- F   SMPL= 1284 F         SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   4   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  11   REGISTER POSITION CHANGE

638  16:03:17   96.0 16335 2228   431   608     0     0  4269  4597  4326  4629 21089    2228  8955  8866   431   608     0     0    0.14  0.68  1.23  1.29    4.0  32.6  14.0 242.1   0.0   0.0
                                                                                          164   564   565   500   494   451   522                              0.0  42.4  18.1 314.7   0.0   0.0
  0     0.0   120.5            654   603   610   599   612   671   672   659   664          72   114   109    17    23     0     0                              3.0  36.3  15.6 269.7   0.0   0.1
   NOZZLE =  0 in   SPREADER = -6 in   IN REG =  30 DEG   OUT REG =  30 DEG   P WB(in) = 2.50in H20   P WB(out) = 2.40in H20   DP(in) = 0.30in H20   DP(out) = 0.40in H20   FURN P = 0.06in H20   COAL P = 9.10in H20
   MILL=  169 F   EXIT= 1370 F   EXIT(sp)= ---- F   SMPL= 1263 F         SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   5   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  12   REGISTER POSITION CHANGE

652  16:11:49   95.7 16298 2224   441   632     0     0  4341  4192  4409  4016 20253    2224  8424  8532   441   632     0     0    0.14  0.65  1.18  1.24    4.2  40.0  14.2 225.0   0.0   0.0
                                                                                          163   567   566   505   509   451   530                              0.0  50.0  17.8 281.3   0.0   0.0
  0     0.0   120.5            663   608   624   606   619   679   679   665   669          71   108   105    17    25     0     0                              3.0  42.9  15.2 241.1   0.0   0.0
   NOZZLE =  0 in   SPREADER = -6 in   IN REG =  30 DEG   OUT REG =  30 DEG   P WB(in) = 2.50in H20   P WB(out) = 2.40in H20   DP(in) = 0.30in H20   DP(out) = 0.40in H20   FURN P = 0.06in H20   COAL P = 9.10in H20
   MILL=  169 F   EXIT= 1347 F   EXIT(sp)= ---- F   SMPL= 1253 F         SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   6   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  13   REGISTER POSITION CHANGE
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DATE          :  07-01-83                    TER DIA       :  12
SYSTEM        :  LWS                         SPREADER      :  4"-4@15
BURNER        :  RSC DMB                     R.H./B.P.     :  FJ
FUEL          :  UTAH6                       OIL CHECK     :  97.32

              LOAD         PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2    CO    CO2    NO    SO2  DUPONT
PT#   TIME   MBTU/HR  TA                            FLOW SCFM                                           FLOW SCFM                         SR (CUM)                              MEASURED
  OIL          CALC  SCFM                                                                  TEMP (F)              CORR TO 0% O2
(%)   LOAD     MEAS                                  TEMP (F)                                          VELOCITY (FT/SEC)                                                   CORR TO 3% O2

 55  13:51:12    95.4 16245 2869   425   579     0     0  3543  4727  3868  4658 20669    2069  8527  8269   425   579     0     0    0.18  0.70  1.21  1.27     4.6  35.0  13.8 315.0 260.0 520.0
                                                                                          143   594   592   519   511   452   538                              0.0  44.8  17.7 403.4 332.9 665.9
  0    0.0    120.5             409   634   650   638   651   704   706   692   700          89   112   104    17    23     0     0                              3.0  38.4  15.1 345.7 285.4 570.7
     NOZZLE =   0 in    SPREADER =  -6 in    IN REG =  25 DEG    OUT REG =  25 DEG    P WB(in) = 0.00in H20    P WB(out) = 0.00in H20    DP(in) = 0.00in H20    DP(out) = 0.00in H20    FURN P = 0.00in H20    COAL P = 0.00in H20
     MILL=  142 F   EXIT= 1442 F   EXIT(sp)= 1498 F   SMPL= 1272 F          SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   1   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  14   GRAB SAMPLE

106  14:19:46    96.0 16342 2593   387   546     0     0  4004  4790  4766  4215 21300    2593  8981  8793   387   546     0     0    0.16  0.71  1.25  1.30     5.0  30.0  13.2 310.0 260.0 460.0
                                                                                          145   586   580   511   491   454   533                              0.0  39.4  17.3 406.9 341.3 603.0
  0    0.0    120.5             526   741   754   747   753   697   699   686   690          81   117   109    15    21     0     0                              3.0  33.8  14.9 348.8 292.5 517.5
     NOZZLE =   0 in    SPREADER =  -6 in    IN REG =  25 DEG    OUT REG =  25 DEG    P WB(in) = 3.50in H20    P WB(out) = 3.40in H20    DP(in) =-0.30in H20    DP(out) = 0.50in H20    FURN P = 0.01in H20    COAL P =10.10in H20
     MILL=  145 F   EXIT= 1340 F   EXIT(sp)= 1633 F   SMPL= 1250 F          SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   2   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  15   BASELINE

161  14:48:52    99.5 16940 2924   639   714   803   703  3989  4132  4216  3959 22079    2924  8175  8121   639   714   803   703    0.17  0.66  1.13  1.30     5.0  33.0  13.6 310.0 240.0 480.0
                                                                                          145   565   564   512   540   530   586                              0.0  43.3  17.9 406.9 315.0 630.0
  0    0.0    120.5             401   638   641   655   661   687   688   673   678          91   104    99    25    29    32    29                              3.0  37.1  15.3 348.0 270.0 540.0
     NOZZLE =  -6 in    SPREADER =  -6 in    IN REG =  25 DEG    OUT REG =  25 DEG    P WB(in) = 3.50in H20    P WB(out) = 3.40in H20    DP(in) =-0.30in H20    DP(out) = 0.50in H20    FURN P = 0.01in H20    COAL P = 9.00in H20
     MILL=  143 F   EXIT= 1482 F   EXIT(sp)= 1538 F   SMPL= 1270 F          SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   3   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  16

180  14:59:12   100.9 17179 2965   740  1043  1399  1964  3223  4114  4325  2748 22529    2965  7073  7337   740  1043  1399  1964    0.17  0.58  1.01  1.31     5.1  75.0  13.4 280.0 260.0 480.0
                                                                                          146   573   562   517   560   550   618                              0.0  99.1  17.7 369.8 343.4 634.0
  0    0.0    120.5             398   651   661   672   681   696   697   685   685          92    91    90    29    43    57    85                              3.0  84.9  15.2 317.0 294.3 543.4
     NOZZLE =   0 in    SPREADER =  -6 in    IN REG =  25 DEG    OUT REG =  25 DEG    P WB(in) = 3.50in H20    P WB(out) = 3.40in H20    DP(in) =-0.30in H20    DP(out) = 0.50in H20    FURN P = 0.01in H20    COAL P = 9.00in H20
     MILL=  147 F   EXIT= 1499 F   EXIT(sp)= 1517 F   SMPL= 1245 F          SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   4   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  17

205  15:11:14   100.1 17046 2482  1598  1368  1645  1956  2955  3162  4417  2368 21950    2482  6784  6116  1598  1368  1645  1956    0.15  0.54  0.90  1.29     4.8  40.0  13.6 310.0 260.0 400.0
                                                                                          145   560   557   545   601   593   638                              0.0  51.9  17.6 401.9 337.0 622.2
  0    0.0    120.5             438   679   678   683   692   701   702   689   688          77    86    74    64    58    69    86                              3.0  44.4  15.1 344.4 288.9 533.3
     NOZZLE =   0 in    SPREADER =  -6 in    IN REG =  25 DEG    OUT REG =  25 DEG    P WB(in) = 3.50in H20    P WB(out) = 3.40in H20    DP(in) =-0.30in H20    DP(out) = 0.50in H20    FURN P = 0.01in H20    COAL P = 9.00in H20
     MILL=  155 F   EXIT= 1356 F   EXIT(sp)= 1421 F   SMPL= 1230 F          SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   5 . ELAPSED TIME, MIN   3   RECORD ON TRK   0   FILE  18   UNSTABLE FLAME
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DATE              :    07-06-83                              TER DIA         :    12
SYSTEM            :    LWS                                   SPREADER        :    4-4015
BURNER            :    RSC DMB                               R.H./B.P.       :    FJ
FUEL              :    UTAH6                                 OIL CHECK       :    95.94

              LOAD         PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2 TOTAL     O2    CO    CO2    NO    SO2  DUPONT
PT#    TIME  MBTU/HR  TA                          FLOW SCFM                                                 FLOW SCFM                         SR (CUM)                          MEASURED
  OIL         CALC  SCFM                                                                  TEMP (F)                CORR TO 0% O2
(%)   LOAD    MEAS                                TEMP (F)                                            VELOCITY (FT/SEC)                                                  CORR TO 3% O2

257  09:53:00   97.5 16597 2666   561   520     0     0  3923  4075  4250  3707 19710    2666  7965  7998   561   520     0     0    0.16  0.64  1.12  1.19     3.4   30.0  14.4 285.0 305.0 540.0
                                                                                          160   591   586   523   583   547   532                              0.0   35.8  17.2 340.1 363.9 644.5
  0     0.0   121.7         530   654   653   657   638   699   699   686   690            85   104   100    22    22     0     0                              3.0   30.7  14.7 291.5 311.9 552.3
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  25 DEG   OUT REG =  25 DEG   P WB(in) = 2.70in H20   P WB(out) = 2.80in H20   DP(in) =-0.25in H20   DP(out) = 0.10in H20   FURN P = 0.09in H20   COAL P = 8.40in H20
     MILL=  164 F   EXIT= 1559 F   EXIT(sp)= 1020 F   SMPL= 1254 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM  (Ca)/(S)=  0.00
     VALID DATA POINT #   1   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  19   UNSTAGED-GRAB SAMPLE

339  10:36:56  101.0 17323 2916   992  1040   818   841  3584  3394  3577  3411 20572    2916  6988  6978   992  1040   818   841    0.17  0.57  0.97  1.19     3.4   25.0  14.6 260.0 300.0 560.0
                                                                                          141   581   579   546   608   579   611                              0.0   29.8  17.4 310.2 358.0 668.2
  0     0.0   121.7         307   677   678   679   682   702   702   686   693            90    91    87    40    44    34    36                              3.0   25.6  14.9 265.9 306.0 572.1
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  25 DEG   OUT REG =  25 DEG   P WB(in) = 1.90in H20   P WB(out) = 2.00in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.18in H20   COAL P = 8.40in H20
     MILL=  134 F   EXIT= 1537 F   EXIT(sp)= 1031 F   SMPL= 1242 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM  (Ca)/(S)=  0.00
     VALID DATA POINT #   2   ELAPSED TIME, MIN   8   RECORD ON TRK   0   FILE  20   INTERMEDIATE STAGING

555  12:22:20   99.2 16893 2707  1121  1176  1085  1574  3403  2940  3532  2862 20401    2707  6394  6344  1121  1176  1085  1574    0.16  0.54  0.91  1.21     3.7   45.0  14.6 210.0 260.0 520.0
                                                                                          161   558   562   539   596   586   640                              0.0   54.6  17.7 254.9 315.6 631.2
  0     0.0   114.5         518   688   691   689   701   713   713   692   701            87    81    77    45    50    45    69                              3.0   46.8  15.2 218.5 270.5 541.0
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  25 DEG   OUT REG =  25 DEG   P WB(in) = 1.90in H20   P WB(out) = 2.00in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.18in H20   COAL P = 8.40in H20
     MILL=  163 F   EXIT= 1483 F   EXIT(sp)= 1551 F   SMPL= 1231 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM  (Ca)/(S)=  0.00
     VALID DATA POINT #   3   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  21   INTERMEDIATE STAGING

567  12:30:02  102.6 17463 2635  1084  1135  1031  1515  3489  3323  4091  3149 21452    2635  7240  6812  1084  1135  1031  1515    0.15  0.57  0.96  1.23     4.0   30.0  14.2 250.0 280.0 530.0
                                                                                          161   567   575   523   584   557   628                              0.0   37.1  17.5 308.8 345.9 654.7
  0     0.0   114.5         523   686   690   689   701   716   715.  698   705            84    93    84    43    47    42    66                              3.0   31.8  15.0 264.7 296.5 561.2
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.80in H20   P WB(out) = 2.30in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P =-0.02in H20   COAL P =10.50in H20
     MILL=  165 F   EXIT= 1520 F   EXIT(sp)= 1573 F   SMPL= 1266 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM  (Ca)/(S)=  0.00
     VALID DATA POINT #   4   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  22   INT. STAGING;REG. CLOSED TO 20

610  12:55:16  100.9 17177 2612  1399  1443  1163  1315  3225  3003  3549  2920 20628    2612  6469  6228  1399  1443  1163  1315    0.15  0.53  0.89  1.20     3.6   45.0  15.0 220.0 270.0 570.0
                                                                                          161   564   568   526   598   550   610                              0.0   54.3  18.1 265.5 325.9 687.9
  0     0.0   114.5         533   694   695   689   696   716   715   697   703            83    83    77    55    61    47    56                              3.0   46.6  15.5 227.6 279.3 589.7
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.80in H20   P WB(out) = 2.30in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P =-0.02in H20   COAL P =10.50in H20
     MILL=  164 F   EXIT= 1484 F   EXIT(sp)= 1567 F   SMPL= 1243 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM  (Ca)/(S)=  0.00
     VALID DATA POINT #   5   ELAPSED TIME, MIN   3   RECORD ON TRK   0   FILE  23   INT. STAGING;REG. CLOSED TO 20

742  13:56:57   98.5 16768 2764  1766  1770  1759  1763  2677  2528  2491  2846 20365    2764  5338  5205  1766  1770  1759  1763    0.16  0.48  0.79  1.21     3.8   50.0  14.6 135.0 280.0 540.0
                                                                                          165   520   531   535   597   587   622                              0.0   61.0  17.8 164.8 341.9 659.3
  0     0.0   114.5         504   684   682   681   685   699   699   672   690            89    65    62    70    75    74    76                              3.0   52.3  15.3 141.3 293.0 565.1
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.10in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.00in H20   COAL P =10.50in H20
     MILL=  166 F   EXIT= 1388 F   EXIT(sp)= 1463 F   SMPL= 1195 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM  (Ca)/(S)=  0.00
     VALID DATA POINT #   6   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  24   INTRMEDIATE STAGING

832  14:42:00   98.7 16802 2683  1923  2120  1844  2104  2370  2082  2510  2421 20065    2683  4939  4452  1923  2120  1844  2104    0.16  0.45  0.72  1.19     3.5   60.0  14.6 120.0 300.0 560.0
                                                                                          166   522   532   553   609   596   632                              0.0   72.0  17.5 144.0 360.0 672.0
  0     0.0   114.5         522   683   684   680   680   695   693   666   686            86    60    53    78    91    78    92                              3.0   61.7  15.0 123.4 308.6 576.0
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.10in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.00in H20   COAL P =10.50in H20
     MILL=  169 F   EXIT= 1407 F   EXIT(sp)= 1504 F   SMPL= 1184 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM  (Ca)/(S)=  0.00
     VALID DATA POINT #   7   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  25   FINAL STAGING
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DATE          :   07-07-83                                     TER DIA        :   8
SYSTEM        :   LWS                                          SPREADER       :   4"-4@15
BURNER        :   RSC  DMB                                     R.H./B.P.      :   FJ
FUEL          :   UTAH6                                        OIL CHECK      :   97.38

               LOAD          PRIN  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIN  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2 TOTAL    O2    CO   CO2    NO   SO2 DUPONT
PT#    TIME  MBTU/HR  TA                             FLOW SCFM                                                FLOW SCFM                        SR (CUM)                           MEASURED
 OIL          CALC  SCFM                                                                     TEMP (F)            CORR TO 0% O2                                                CORR TO 3% O2
(%)   LOAD    MEAS                                   TEMP (F)                                          VELOCITY (FT/SEC)

 259 12:00:33   98.9 16834 2546   485   529     0     0  4258  3963  4306  3905 19991     2546  8211  8221   485   529     0     0    0.15  0.64  1.13  1.19    3.4  30.0  15.4 250.0 260.0 480.0
                                                                                          167   578   576   445   493   443   437                            0.0  35.0  18.4 298.3 310.2 572.7
   0    0.0  121.7            539   640   644   629   593   700   700   683   690          82   106   102    40    45     0     0                            3.0  30.7  15.8 255.7 265.9 490.5
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 3.50in H20   P WB(out) = 3.40in H20   DP(in) = 0.20in H20   DP(out) =-0.20in H20   FURN P = 0.01in H20   COAL P = 0.00in H20
     MILL=  172 F   EXIT= 1573 F   EXIT(sp)= 1738 F   SMPL= 1259 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   1   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  26   NO STAGING

 352 12:55:17  101.1 17207 2683  1483  1322  1432  1339  3005  3471  3189  3094 21017     2683  6283  6475  1483  1322  1432  1339    0.16  0.52  0.90  1.22    3.9  43.0  14.2 190.0   0.0   0.0
                                                                                          166   560   553   519   588   581   603                            0.0  52.8  17.4 233.3   0.0   0.0
   0    0.0  121.7            520   674   671   669   673   695   696   677   684          87    80    78   131   125   134   128                            3.0  45.3  14.9 200.0   0.0   0.1
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 3.50in H20   P WB(out) = 3.40in H20   DP(in) = 0.20in H20   DP(out) =-0.20in H20   FURN P = 0.01in H20   COAL P = 0.00in H20
     MILL=  172 F   EXIT= 1510 F   EXIT(sp)=  735 F   SMPL= 1261 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   2   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  27   INTERMEDIATE STAGING

 431 13:33:05  101.0 17196 2709  1823  1769  1621  1768  2895  2565  2681  2819 20651     2709  5500  5460  1823  1769  1621  1768    0.16  0.48  0.79  1.20    3.6  35.0  14.6 170.0   0.0   0.0
                                                                                          172   509   521   499   564   535   584                            0.0  42.2  17.6 205.2   0.0   0.0
   0    0.0  116.9            537   661   659   653   660   671   669   648   659          88    66    64   158   163   145   166                            3.0  36.2  15.1 175.9   0.0   0.0
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 3.50in H20   P WB(out) = 3.40in H20   DP(in) = 0.20in H20   DP(out) =-0.20in H20   FURN P = 0.01in H20   COAL P =10.40in H20
     MILL=  179 F   EXIT= 1458 F   EXIT(sp)= 1667 F   SMPL= 1238 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   3   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  28   PREHEAT LOW

 472 13:56:25   99.5 16946 2702  1753  1754  1590  1735  2081  2452  2599  2771 20237     2702  5370  5333  1753  1754  1590  1735    0.16  0.48  0.79  1.19    3.5  30.0  15.0 165.0 290.0 540.0
                                                                                          172   544   559   547   612   593   641                            0.0  36.0  18.0 198.0 340.0 648.0
   0    0.0  116.9            545   718   716   711   719   733   731   707   718          88    67    65   159   169   151   172                            3.0  30.9  15.4 169.7 298.3 555.4
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.20in H20   DP(out) =-0.05in H20   FURN P = 0.22in H20   COAL P =10.40in H20
     MILL=  179 F   EXIT= 1458 F   EXIT(sp)= 1679 F   SMPL= 1237 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   4   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  29   INTERMEDIATE STAGING

 560 14:37:33   99.0 16861 2689  2170  2155  2218  2253  2283  2002  2373  2097 20248     2689  4470  4205  2178  2155  2218  2253    0.16  0.42  0.68  1.20    3.6  35.0  15.0 160.0 280.0 520.0
                                                                                          172   521   530   553   612   589   625                            0.0  42.2  18.1 193.1 337.9 627.6
   0    0.0  116.9            529   696   693   690   690   704   701   674   690          87    55    51   199   200   210   220                            3.0  36.2  15.5 165.5 289.7 537.9
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 0.90in H20   P WB(out) = 0.80in H20   DP(in) = 0.20in H20   DP(out) =-0.05in H20   FURN P = 0.13in H20   COAL P =10.40in H20
     MILL=  176 F   EXIT= 1481 F   EXIT(sp)= 1573 F   SMPL= 1238 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   5   ELAPSED TIME, MIN  15   RECORD ON TRK   0   FILE  30   FINAL STAGING

 617 15:11:11  100.2 17050 2610  2127  2115  2143  2178  3606  3540  1246  1142 20707     2610  2308  7146  2127  2115  2143  2178    0.15  0.29  0.71  1.21    3.8  33.0  14.8 170.0 270.0 510.0
                                                                                          172   576   493   572   629   626   643                            0.0  40.3  18.1 207.6 329.7 622.7
   0    0.0  116.9            540   710   709   705   705   723   722   675   691          85    31    81   198   207   210   216                            3.0  34.5  15.5 177.9 282.6 533.7
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.60in H20   P WB(out) = 0.80in H20   DP(in) = 0.10in H20   DP(out) =-0.10in H20   FURN P = 0.10in H20   COAL P =10.80in H20
     MILL=  177 F   EXIT= 1517 F   EXIT(sp)= 1570 F   SMPL= 1272 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   6   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  31   IN(13.3%),OUT(40.0%),TERTS(47.0%)

 692 15:35:45  104.5 17784 2688  2867  2107  2158  2208  1170  1178  3652  3442 21477     2688  7094  2355  2867  2107  2158  2208    0.15  0.55  0.68  1.21    3.7  31.0  15.0 120.0 200.0 540.0
                                                                                          173   494   577   562   620   618   644                            0.0  37.6  18.2 145.7 339.9 655.5
   0    0.0  116.9            545   710   709   706   708   707   709   702   711          88    84    29   264   205   209   220                            3.0  32.3  15.6 124.9 291.3 561.8
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.60in H20   P WB(out) = 0.80in H20   DP(in) = 0.10in H20   DP(out) =-0.10in H20   FURN P = 0.10in H20   COAL P =10.40in H20
     MILL=  179 F   EXIT= 1353 F   EXIT(sp)=  578 F   SMPL= 1160 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   7   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  32   IN(40),OUT(13.3),TERTS(47)
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DATE        :   07-11-83                          TER DIA      :   8
SYSTEM      :   LWS                               SPREADER     :   4"-4015
BURNER      :   RSC DMB                           R.H./B.P.    :   FJ
FUEL        :   UTAH6                             OIL CHECK    :   97.01

                LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2    CO   CO2    NO   SO2  DUPONT
PT#    TIME   MBTU/HR  TA                         FLOW SCFM                                                FLOW SCFM                              SR (CUM)                              MEASURED
  OIL           CALC  SCFM                                                                  TEMP (F)              CORR TO 0% O2
(%)    LOAD     MEAS                                  TEMP (F)                                          VELOCITY (FT/SEC)                                                      CORR TO 3% O2

 573 14:41:23   97.0 16518 3031   359   432     0     0  4085  3536  4182  3670 19295    3031  7851  7621   359   432     0     0    0.18  0.66  1.12  1.17     3.1  30.0  15.0 265.0   0.0   0.0
                                                                                          148   608   620   404   455   415   477                              0.0  35.2  17.6 310.9   0.0   0.0
   0    0.0    119.3       311   672   707   672   664   760   759   742   745             95   105    98    28    36 .   0     0                              3.0  30.2  15.1 266.5   0.0   0.0
     NOZZLE =   0 in    SPREADER =  -6 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 0.00in H2O    P WB(out) = 0.00in H2O    DP(in) = 0.00in H2O    DP(out) = 0.00in H2O    FURN P = 0.00in H2O    COAL P = 0.00in H2O
     MILL=  146 F   EXIT= 1495 F   EXIT(sp)= 1509 F   SMPL= 1225 F           SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
     VALID DATA POINT #   1   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  33   UNSTAGED

 641 15:15:10   98.5 16770 3227  1541  2159  2334  2352  2513  1995  2415  1947 20483    3227  4363  4507  1541  2159  2334  2352    0.19  0.45  0.72  1.22     3.9  30.0  14.4 140.0   0.0   0.0
                                                                                          142   561   582   580   627   616   676                              0.0  36.8  17.7 171.9   0.0   0.0
   0    0.0    119.3       286   740   755   746   747   754   751   727   735            100    56    56   144   211   226   241                              3.0  31.6  15.2 147.4   0.0   0.1
     NOZZLE =   0 in    SPREADER =  -6 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.40in H2O    P WB(out) = 2.40in H2O    DP(in) = 0.10in H2O    DP(out) = 0.10in H2O    FURN P = 0.04in H2O    COAL P =11.40in H2O
     MILL=  140 F   EXIT= 1384 F   EXIT(sp)= 1442 F   SMPL= 1169 F           SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
     VALID DATA POINT #   2   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  34   STAGED

 706 15:48:10  105.9 18032 3256  1877  2240  2414  2434  1635  1525  3292  2859 21533    3256  6152  3160  1877  2240  2414  2434    0.18  0.52  0.70  1.19     3.5  35.0  14.8 140.0   0.0   0.0
                                                                                          141   456   502   484   537   508   561                              0.0  42.0  17.8 168.0   0.0   0.0
   0    0.0    114.5       254   614   623   618   622   616   616   607   610            101    70    36   160   201   211   224                              3.0  36.0  15.2 144.0   0.0   0.1
     NOZZLE =   0 in    SPREADER =  -6 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.40in H2O    P WB(out) = 2.40in H2O    DP(in) = 0.10in H2O    DP(out) = 0.10in H2O    FURN P = 0.04in H2O    COAL P =11.40in H2O
     MILL=  140 F   EXIT= 1414 F   EXIT(sp)= 1507 F   SMPL= 1195 F           SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
     VALID DATA POINT #   3   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  35   BIAS INNER REGISTER-66.0%
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DATE          :   07-12-83                            TER DIA       :   8
SYSTEM        :   LWS                                 SPREADER      :   4"-4015
BURNER        :   RSC  DMB                            R.H./B.P.     :   56.0/29.62
FUEL          :   UTAH6                               OIL CHECK     :   95.50

              LOAD           PRIN  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIN  SEC1  SEC2  TER1  TER2  TER3  TER4     PRIN  SEC1  SEC2  TOTAL     O2    CO    CO2    NO    SO2  DUPONT
PT#    TIME   MBTU/HR  TA                            FLOW SCFM                                          FLOW SCFM                                  SR (CUM)                                    MEASURED
 OIL          CALC  SCFM                                                                   TEMP (F)                CORR TO 0% O2
(%)   LOAD    MEAS                                   TEMP (F)                                             VELOCITY (FT/SEC)                                                                CORR TO 3% O2

 245  10:24:51  100.5 17113 2903   670   463     0     0  4305  3767  4449  3879 20437     2903  8328  8072   670   463     0     0     0.17  0.66  1.13  1.19      3.5  35.0  14.8  210.0   0.0   0.0
                                                                                            139   567   571   420   531   475   556                               0.0  42.0  17.8  252.0   0.0   0.0
   0    0.0   132.4           397   646   646   637   650   679   680   668   672            89   107    99    53    41     0     0                               3.0  36.0  15.2  216.0   0.0   0.0
   NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 5.80in H20   P WB(out) = 6.00in H20   DP(in) = 0.10in H20   DP(out) =-0.20in H20   FURN P = 0.01in H20   COAL P =11.00in H20
   MILL=  136 F   EXIT= 1473 F   EXIT(sp)= 1696 F   SMPL= 1236 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   1   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  36   UNSTAGED

 286  10:45:43  102.9 17510 2924   646   457     0     0  4304  4080  4403  3753 20566     2924  8156  8384   646   457     0     0     0.17  0.63  1.11  1.17      3.2  36.0  15.0  245.0   0.0   0.0
                                                                                            142   571   567   436   525   482   558                               0.0  42.5  17.7  289.0   0.0   0.0
   0    0.0   124.1           399   641   641   634   646   676   677   665   668            91   105   103    52    41     0     0                               3.0  36.4  15.2  247.8   0.0   0.0
   NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 5.80in H20   P WB(out) = 6.00in H20   DP(in) = 0.10in H20   DP(out) =-0.20in H20   FURN P = 0.01in H20   COAL P =11.00in H20
   MILL=  141 F   EXIT= 1563 F   EXIT(sp)= 1762 F   SMPL= 1267 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   2   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  37   REGISTER BASELINE(20)

 447  12:07:59  100.3 17074 3073  2134  2093  1984  2141  2778  2669  2785  2330 21986     3073  5115  5446  2134  2093  1984  2141     0.18  0.48  0.80  1.29      4.8  35.0  13.4  150.0   0.0 500.0
                                                                                            156   564   562   580   631   599   639                               0.0  45.4  17.4  194.4   0.0 648.1
   0    0.0   116.9           389   697   702   695   697   699   700   681   687            97    65    67   200   206   189   212                               3.0  38.9  14.9  166.7   0.0 555.6
   NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) =.5.80in H20   P WB(out) = 6.00in H20   DP(in) = 0.10in H20   DP(out) =-0.20in H20   FURN P = 0.01in H20   COAL P =11.00in H20
   MILL=  157 F   EXIT= 1365 F   EXIT(sp)= 1554 F   SMPL= 1151 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   3   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  38

 126  14:41:45   97.9 16659 2598  2151  2023  2275  2162  2800  2047  2467  2300 20823     2598  4768  4847  2151  2023  2275  2162     0.16  0.44  0.73  1.25      4.3  37.0  14.4  140.0 322.0 520.0
                                                                                            159   524   539   540   613   586   627                               0.0  46.5  18.1  176.0 404.9 653.9
   0    0.0   112.1           435   686   688   684   685   690   687   665   674            83    59    58   194   196   214   212                               3.0  39.9  15.5  150.9 347.1 560.5
   NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.20in H20   P WB(out) = 1.00in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.07in H20   COAL P = 0.00in H20
   MILL=  163 F   EXIT= 1379 F   EXIT(sp)= 1566 F   SMPL= 1187 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   4   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  39

 220  15:29:13   97.2 16553 2700  2164  2070  2311  2201  2678  1761  2300  2149 20334     2700  4449  4439  2164  2070  2311  2201     0.16  0.43  0.70  1.23      4.0  35.0  14.8  160.0 319.0 280.0
                                                                                            160   530   546   561   630   608   649                               0.0  43.2  18.3  197.6 394.1 345.9
   0    0.0   115.7           436   704   709   704   706   712   707   685   694            86    55    53   199   203   222   220                               3.0  37.1  15.7  169.4 337.8 296.5
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.20in H20   P WB(out) = 1.00in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.07in H20   COAL P = 0.00in H20
   MILL=  162 F   EXIT= 1447 F   EXIT(sp)= 1105 F   SMPL= 1199 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   5   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  40   INT. RETRACTION

 240  15:43:57   96.1 16353 2654  2138  2055  2311  2190  2668  1718  2313  2159 20205     2654  4472  4386  2138  2055  2311  2190     0.16  0.44  0.70  1.24      4.1  38.0  14.6   90.0   0.0 590.0
                                                                                            156   531   551   563   627   605   651                               0.0  47.2  18.1  111.8   0.0 733.1
   0    0.0   115.7           394   713   715   710   712   719   714   691   699            84    55    53   197   201   222   219                               3.0  40.5  15.6   95.9   0.0 628.1
   NOZZLE =  -3 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.20in H20   P WB(out) = 1.00in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.07in H20   COAL P = 0.00in H20
   MILL=  155 F   EXIT= 1377 F   EXIT(sp)= 1060 F   SMPL= 1132 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   6   ELAPSED TIME, MIN   3   RECORD ON TRK   0   FILE  41   NOZZLE RETRACTION

 265  15:57:02   99.0 16994 2720  2170  2050  2312  2206  2671  1714  2306  2136 20294     2720  4443  4386  2170  2058  2312  2206     0.16  0.42  0.60  1.19      3.5  38.0  14.8  100.0   0.0 560.0
                                                                                            154   528   543   563   640   611   658                               0.0  45.6  17.8  120.0   0.0 672.0
   0    0.0   115.7           379   717   719   713   714   724   715   690   703            86    55    53   200   204   223   222                               3.0  39.1  15.2  102.9   0.0 576.1
   NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.20in H20   P WB(out) = 1.00in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.07in H20   COAL P = 0.00in H20
   MILL=  154 F   EXIT= 1354 F   EXIT(sp)= 1073 F   SMPL= 1143 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   7   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  42   NOZZLE BASELINE
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DATE                 :    07-12-83                       TER DIA          :    8
SYSTEM               :    LWS                            SPREADER         :    4"-4015
BURNER               :    RSC DMB                        R.H./B.P.        :    56.0/29.62
FUEL                 :    UTAH6                          OIL CHECK        :    95.50

           LOAD         PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4     PRIM  SEC1  SEC2 TOTAL     O2    CO    CO2   NO     SO2  DUPONT
PT#   TIME  MBTU/HR  TA                          FLOW SCFM                                        FLOW SCFM                               SR (CUM)                                MEASURED
 OIL         CALC  SCFM                                                                   TEMP (F)          CORR TO 0% O2
(%)  LOAD    MEAS                                TEMP (F)                                           VELOCITY (FT/SEC)                                                     CORR TO 3% O2

245  10:24:51  100.5 17113 2903   670   463     0     0  4305  3767  4449  3879 20437    2903  8328  8072   670   463     0     0     0.17  0.66  1.13  1.19      3.5  35.0  14.8 210.0    0.0    0.0
                                                                                          139   567   571   420   531   475   556                                0.0  42.0  17.8 252.0    0.0    0.0
  0    0.0   132.4       397   646   646   637   650   679   680   668   672              89   107    99    53    41     0     0                                3.0  36.0  15.2 216.0    0.0    0.0
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 5.80in H20   P WB(out) = 6.00in H20   DP(in) = 0.10in H20   DP(out) =-0.20in H20   FURN P = 0.01in H20   COAL P =11.00in H20
     MILL=  136 F   EXIT= 1473 F   EXIT(sp)= 1696 F   SMPL= 1236 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   1  ELAPSED TIME, MIN   5  RECORD ON TRK   0  FILE  36  UNSTAGED

286  10:45:43  102.9 17510 2924   646   457     0     0  4304  4080  4403  3753 20566    2924  8156  8304   646   457     0     0     0.17  0.63  1.11  1.17      3.2  36.0  15.0 245.0    0.0    0.0
                                                                                          142   571   567   436   525   482   558                                0.0  42.5  17.7 289.0    0.0    0.0
  0    0.0   124.1       399   641   641   634   646   676   677   665   668              91   105   103    52    41     0     0                                3.0  36.4  15.2 247.8    0.0    0.0
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 5.80in H20   P WB(out) = 6.00in H20   DP(in) = 0.10in H20   DP(out) =-0.20in H20   FURN P = 0.01in H20   COAL P =11.00in H20
     MILL=  141 F   EXIT= 1563 F   EXIT(sp)= 1762 F   SMPL= 1267 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   2  ELAPSED TIME, MIN   5  RECORD ON TRK   0  FILE  37  REGISTER BASELINE(20)

447  12:07:59  100.3 17074 3073  2134  2093  1984  2141  2778  2669  2785  2330 21986    3073  5115  5446  2134  2093  1984  2141     0.18  0.48  0.80  1.29      4.8  35.0  13.4 150.0    0.0  560.0
                                                                                          156   564   562   580   631   599   639                                0.0  45.4  17.4 194.4    0.0  640.1
  0    0.0   116.9       389   697   702   695   697   699   700   681   687              97    65    67   200   206   189   212                                3.0  38.9  14.9 166.7    0.0  555.6
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 5.80in H20   P WB(out) = 6.00in H20   DP(in) = 0.10in H20   DP(out) =-0.20in H20   FURN P = 0.01in H20   COAL P =11.00in H20
     MILL=  157 F   EXIT= 1365 F   EXIT(sp)= 1554 F   SMPL= 1151 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   3  ELAPSED TIME, MIN  10  RECORD ON TRK   0  FILE  38

126  14:41:45   97.9 16659 2598  2151  2023  2275  2162  2800  2047  2467  2300 20823    2598  4768  4847  2151  2023  2275  2162     0.16  0.44  0.73  1.25      4.3  37.0  14.4 140.0  322.0  520.0
                                                                                          159   524   539   540   613   586   627                                0.0  46.5  18.1 176.0  404.9  653.9
  0    0.0   112.1       435   686   688   684   685   690   687   665   674              83    59    58   194   196   214   212                                3.0  39.9  15.5 150.9  347.1  560.5
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.20in H20   P WB(out) = 1.00in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.07in H20   COAL P = 0.00in H20
     MILL=  163 F   EXIT= 1379 F   EXIT(sp)= 1566 F   SMPL= 1187 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   4  ELAPSED TIME, MIN  10  RECORD ON TRK   0  FILE  39

220  15:29:13   97.2 16553 2700  2164  2070  2311  2201  2678  1761  2300  2149 20334    2700  4449  4439  2164  2070  2311  2201     0.16  0.43  0.70  1.23      4.0  35.0  14.8 160.0  319.0  280.0
                                                                                          160   530   546   561   630   608   649                                0.0  43.2  18.3 197.6  394.1  345.9
  0    0.0   115.7       436   704   709   704   706   712   707   685   694              86    55    53   199   203   222   220                                3.0  37.1  15.7 169.4  337.8  296.5
     NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.20in H20   P WB(out) = 1.00in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.07in H20   COAL P = 0.00in H20
     MILL=  162 F   EXIT= 1447 F   EXIT(sp)= 1185 F   SMPL= 1199 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   5  ELAPSED TIME, MIN   5  RECORD ON TRK   0  FILE  40  INT. RETRACTION

240  15:43:57   96.1 16353 2654  2138  2055  2311  2190  2668  1718  2313  2159 20205    2654  4472  4386  2138  2055  2311  2190     0.16  0.44  0.70  1.24      4.1  38.0  14.6  90.0    0.0  590.0
                                                                                          156   531   551   563   627   605   651                                0.0  47.2  18.1 111.8    0.0  733.1
  0    0.0   115.7       394   713   715   710   712   719   714   691   699              84    55    53   197   201   222   219                                3.0  40.5  15.6  95.9    0.0  628.1
     NOZZLE =  -3 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.20in H20   P WB(out) = 1.00in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.07in H20   COAL P = 0.00in H20
     MILL=  155 F   EXIT= 1377 F   EXIT(sp)= 1068 F   SMPL= 1132 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   6  ELAPSED TIME, MIN   3  RECORD ON TRK   0  FILE  41  NOZZLE RETRACTION

265  15:57:02   99.8 16994 2720  2170  2058  2312  2206  2671  1714  2306  2136 20294    2720  4443  4386  2170  2058  2312  2206     0.16  0.42  0.68  1.19      3.5  38.0  14.8 100.0    0.0  560.0
                                                                                          154   528   543   563   640   611   658                                0.0  45.6  17.8 120.0    0.0  672.0
  0    0.0   115.7       379   717   719   713   714   724   715   690   703              86    55    53   200   204   223   222                                3.0  39.1  15.2 102.9    0.0  576.1
     NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.20in H20   P WB(out) = 1.00in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.07in H20   COAL P = 0.00in H20
     MILL=  154 F   EXIT= 1354 F   EXIT(sp)= 1073 F   SMPL= 1143 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   7  ELAPSED TIME, MIN   5  RECORD ON TRK   0  FILE  42  NOZZLE BASELINE
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DATE           :    07-12-83                  TER DIA          :   8
SYSTEM         :    LWS                       SPREADER         :   4"-4015
BURNER         :    RSC DMB                   R.H./B.P.        :   44.0/29.62
FUEL           :    UTAH6                     OIL CHECK        :   95.5

                 LOAD           PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2    CO    CO2   NO     SO2  DUPONT
PT#     TIME   MBTU/HR  TA                                FLOW SCFM                                             FLOW SCFM                          SR (CUM)                              MEASURED
   OIL           CALC  SCFM                                                                   TEMP (F)                 CORR TO 0% O2
(%)     LOAD     MEAS                                     TEMP (F)                                            VELOCITY (FT/SEC)                                                       CORR TO 3% O2

292  16:10:17   100.1  17034  2798  2161  2051  2313  2190  2667  1727  2296  2139  20342    2798  4435  4394  2161  2051  2313  2190    0.16  0.42  0.68  1.19     3.5  40.0  15.0  120.0   0.0  560.0
                                                                                              152   537   554   566   640   608   660                             0.0  48.0  18.0  144.0   0.0  672.0
 0     0.0     115.7           375   719   721   715   718   725   720   696   704              88    55    53   200   203   223   221                             3.0  41.1  15.4  123.4   0.0  576.0
   NOZZLE =  1 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.20in H20   P WB(out) = 1.00in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.07in H20   COAL P = 0.00in H20
   MILL=  154 F   EXIT= 1388 F   EXIT(sp)= 1096 F   SMPL= 1162 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  8   ELAPSED TIME, MIN   3   RECORD ON TRK  0   FILE  43   NOZZLE IN

313  16:26:09   103.1  17545  2753  2154  2046  2310  2192  2669  1712  2309  2129  20274    2753  4430  4382  2154  2046  2310  2192    0.16  0.41  0.66  1.16     2.9  40.0  15.8  145.0   0.0  600.0
                                                                                              152   537   557   567   638   617   660                             0.0  46.4  18.3  168.2   0.0  696.1
 0     0.0     145.7           376   721   722   716   719   727   719   698   707              87    55    53   199   202   224   221                             3.0  39.8  15.7  144.2   0.0  596.7
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.20in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.04in H20   COAL P = 9.50in H20
   MILL=  153 F   EXIT= 1443 F   EXIT(sp)= 1156 F   SMPL= 1214 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  9   ELAPSED TIME, MIN   5   RECORD ON TRK  0   FILE  44   MIN. EXCESS AIR

319  16:31:55    98.7  16794  2750  2143  2038  2296  2192  2674  1729  2301  2159  20281    2750  4460  4403  2143  2038  2296  2192    0.16  0.43  0.69  1.21     3.7  31.0  15.0  160.0   0.0  580.0
                                                                                              152   546   563   582   651   626   663                             0.0  37.6  18.2  194.2   0.0  704.0
 0     0.0     115.7           373   723   724   717   719   729   721   699   709              87    56    54   201   204   225   222                             3.0  32.3  15.6  166.5   0.0  603.5
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.20in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.04in H20   COAL P = 9.50in H20
   MILL=  152 F   EXIT= 1457 F   EXIT(sp)= 1521 F   SMPL= 1215 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  10   ELAPSED TIME, MIN   4   RECORD ON TRK  0   FILE  45   INTERMEDIATE EXCESS AIR

354  16:47:47    99.6  16956  2831  2486  2543  2669  2804  2797  1899  2523  2247  22798    2831  4771  4695  2486  2543  2669  2804    0.17  0:45  0.73  1.34     5.5  35.0  13.4  175.0   0.0  580.0
                                                                                              147   542   557   596   649   629   663                             0.0  47.4  18.2  237.1   0.0  677.4
 0     0.0     115.7           336   709   710   704   710   713   707   687   697              88    60    57   236   254   262   284                             3.0  40.6  15.6  203.2   0.0  580.6
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.20in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.04in H20   COAL P = 9.50in H20
   MILL=  145 F   EXIT= 1436 F   EXIT(sp)= 1617 F   SMPL= 1230 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  11   ELAPSED TIME, MIN  10   RECORD ON TRK  0   FILE  46   HI EXCESS AIR

422  17:18:45    81.1  13801  2896  1726  1793  1604  1729  2082  1552  1870  1510  16762    2896  3381  3633  1726  1793  1604  1729    0.21  0.45  0.72  1.21     3.8  40.0  15.2  150.0   0.0  560.0
                                                                                              148   553   558   576   649   604   668                             0.0  48.8  18.6  183.1   0.0  683.7
 0     0.0      97.8           346   736   743   731   738   744   740   715   721              91    43    44   161   179   154   176                             3.0  41.9  15.9  157.0   0.0  586.1
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 0.75in H20   P WB(out) = 0.80in H20   DP(in) = 0.15in H20   DP(out) =-0.01in H20   FURN P = 0.00in H20   COAL P = 9.20in H20
   MILL=  149 F   EXIT= 1409 F   EXIT(sp)= 1600 F   SMPL= 1130 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  12   ELAPSED TIME, MIN   5   RECORD ON TRK  0   FILE  47   REDUCED LOAD

423  17:23:57    82.1  13975  2885  1705  1787  1582  1710  2064  1532  1839  1491  16596    2885  3331  3595  1705  1787  1582  1710    0.21  0.44  0.70  1.19     3.4  32.0  15.4  150.0 459.0  560.0
                                                                                              149   561   566   585   660   612   682                             0.0  38.2  18.4  179.0 547.7  668.2
 0     0.0      97.8           353   752   757   745   752   760   755   728   735              90    42    44   160   180   153   176                             3.0  32.7  15.8  153.4 469.4  572.7
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.20in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.04in H20   COAL P = 9.50in H20
   MILL=  149 F   EXIT= 1380 F   EXIT(sp)= 1532 F   SMPL= 1116 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  13   ELAPSED TIME, MIN   3   RECORD ON TRK  0   FILE  48   LOW LOAD-LOW EXCESS AIR
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DATE          :   07-13-83                                    TER DIA       :   8
SYSTEM        :   LWS                                         SPREADER      :   4"-4015
BURNER        :   RSC  DMB                                    R.H./B.P.     :   66.0/29.52
FUEL          :   UTAH6                                       OIL CHECK     :   98.78
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              LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9 TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2 TOTAL    O2    CO    CO2   NO    SO2  DUPONT
PT#   TIME   MBTU/HR  TA                            FLOW SCFM                                          FLOW SCFM                          SR (CUM)                             MEASURED
  OIL          CALC  SCFM                                                             TEMP (F)                 CORR TO 0% O2
(%)   LOAD     MEAS                                 TEMP (F)                                       VELOCITY (FT/SEC)                                                       CORR TO 3% O2
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162  10:00:21   103.9 17683 2863   986   412     0     0  3946  4445  4774  3810 21235    2863  8584  8391   986   412     0     0    0.16  0.65  1.12  1.20    3.6  32.0  15.0 235.0 683.5 540.0
                                                                                          137   537   530   426   535   421   412                              0.0  38.6  18.1 283.6 824.9 651.7
  0    0.0      96.6         356   604   584   562   547   620   628   618   618           88   107    99    79    37     0     0                              3.0  33.1  15.5 243.1 707.1 558.6
    NOZZLE =  -2 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 0.00in H2O    P WB(out) = 0.00in H2O    DP(in) = 0.00in H2O    DP(out) = 0.00in H2O    FURN P = 0.00in H2O    COAL P = 0.00in H2O
    MILL=  137 F   EXIT= 1520 F   EXIT(sp)= 1458 F   SMPL= 1255 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #   1   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  71   UNSTAGED

227  10:35:38   100.3 17075 2620  2126  2252  2231  2175  2522  2059  2486  2151 20621    2620  4637  4581  2126  2252  2231  2175    0.15  0.42  0.69  1.21    3.7  39.0  15.0 150.0   0.0 570.0
                                                                                          159   553   558   607   644   614   643                              0.0  47.3  18.2 182.1   0.0 691.9
  0    0.0       0.0         539   695   700   693   693   699   695   676   683           84    59    56   204   224   216   216                              3.0  40.6  15.6 156.1   0.0 593.1
    NOZZLE =  -2 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.40in H2O    P WB(out) = 1.40in H2O    DP(in) = 0.10in H2O    DP(out) = 0.05in H2O    FURN P = 0.04in H2O    COAL P = 9.20in H2O
    MILL=  163 F   EXIT= 1438 F   EXIT(sp)= 1585 F   SMPL= 1208 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #   2   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  72   STAGED BASELINE-MANUAL MEASUREMENTS

352  11:39:14   101.5 17275 2641  2204  2282  2185  2142  2555  2059  2573  2220 20863    2641  4794  4614  2204  2282  2185  2142    0.15  0.43  0.70  1.21    3.7  32.0  14.8 150.0   0.0 580.0
                                                                                          168   476   485   496   541   515   548                              0.0  38.8  18.0 182.1   0.0 704.0
  0    0.0      93.1         538   592   594   590   591   592   590   577   583           85    56    52   190   206   192   195                              3.0  33.3  15.4 156.1   0.0 603.5
    NOZZLE =  -2 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.40in H2O    P WB(out) = 1.40in H2O    DP(in) = 0.10in H2O    DP(out) = 0.05in H2O    FURN P = 0.04in H2O    COAL P = 9.20in H2O
    MILL=  173 F   EXIT= 1430 F   EXIT(sp)= 1462 F   SMPL= 1207 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #   3   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  73   BASELINE

384  11:50:00   101.8 17327 2635  2165  2239  2145  2135  2515  1980  2501  2150 20463    2635  4651  4495  2165  2239  2145  2135    0.15  0.42  0.68  1.18    3.3  35.0  15.2 160.0  66.0 400.0
                                                                                          169   523   535   509   605   526   608                              0.0  41.5  18.0 189.8  78.3 474.6
  0    0.0      91.9         546   681   685   677   677   682   678   660   664           85    57    53   189   215   190   205                              3.0  35.6  15.5 162.7  67.1 406.0
    NOZZLE =  -2 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.40in H2O    P WB(out) = 1.40in H2O    DP(in) = 0.10in H2O    DP(out) = 0.05in H2O    FURN P = 0.04in H2O    COAL P = 9.20in H2O
    MILL=  175 F   EXIT= 1455 F   EXIT(sp)= 1475 F   SMPL= 1225 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 2.20   SORBENT AIR FLOW=  200  SCFM   [Ca]/[S]=  2.33
    VALID DATA POINT #   4   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  74   LIMESTONE INJECTION-TERTS

414  12:14:57    99.7 16972 2684  2127  2191  2115  2086  2473  1907  2450  2124 20155    2684  4574  4379  2127  2191  2115  2086    0.16  0.43  0.69  1.19    3.4  30.0  15.0 160.0 166.0 600.0
                                                                                          170   551   567   589   647   612   658                              0.0  35.8  17.9 190.9 198.1 715.9
  0    0.0      91.9         483   724   728   721   721   725   722   701   708           87    58    54   201   210   204   210                              3.0  30.7  15.3 163.6 169.8 613.6
    NOZZLE =  -2 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.40in H2O    P WB(out) = 1.40in H2O    DP(in) = 0.10in H2O    DP(out) = 0.05in H2O    FURN P = 0.04in H2O    COAL P = 9.20in H2O
    MILL=  171 F   EXIT= 1462 F   EXIT(sp)= 1587 F   SMPL= 1211 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #   5   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  75   BASELINE

439  12:30:26   100.2 17062 2776  2107  2185  2104  1999  2350  1781  2420  2101 19823    2776  4521  4131  2107  2185  2104  1999    0.16  0.43  0.67  1.16    3.0  30.0  15.2 165.0   0.0 270.0
                                                                                          168   559   575   574   652   570   662                              0.0  35.0  17.7 192.5   0.0 315.0
  0    0.0      89.5         455   738   744   736   833   875   871   715   723           90    57    51   196   219   195   202                              3.0  30.0  15.2 165.0   0.0 270.1
    NOZZLE =  -2 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.40in H2O    P WB(out) = 1.40in H2O    DP(in) = 0.10in H2O    DP(out) = 0.05in H2O    FURN P = 0.04in H2O    COAL P = 9.20in H2O
    MILL=  170 F   EXIT= 1400 F   EXIT(sp)= 1599 F   SMPL= 1235 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 3.50   SORBENT AIR FLOW=  165  SCFM   [Ca]/[S]=  4.26
    VALID DATA POINT #   6   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  76

481  12:51:44   101.2 17228 2710  2056  2189  2116  2092  2486  1877  2415  2075 20016    2710  4490  4363  2056  2189  2116  2092    0.16  0.42  0.67  1.16    3.0  30.0  15.4 160.0  83.0 560.0
                                                                                          164   559   576   576   650   607   671                              0.0  35.0  18.0 186.7  96.8 653.3
  0    0.0      89.5         452   746   752   744   744   749   744   722   730           87    57    54   192   219   203   213                              3.0  30.0  15.4 160.0  83.0 560.1
    NOZZLE =  -2 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.40in H2O    P WB(out) = 1.40in H2O    DP(in) = 0.10in H2O    DP(out) = 0.05in H2O    FURN P = 0.04in H2O    COAL P = 9.20in H2O
    MILL=  166 F   EXIT= 1481 F   EXIT(sp)= 1113 F   SMPL= 1212 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #   7   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  77   BASELINE
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DATE           :   07-13-83                    TER DIA        :   8
SYSTEM         :   LWS                         SPREADER       :   4"-4015
BURNER         :   RSC  DMB                    R.H./B.P.      :   66.0/29.52
FUEL           :   UTAH6                       OIL CHECK      :   98.78
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                 LOAD        PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4     PRIM  SEC1  SEC2  TOTAL     O2    CO    CO2   NO    SO2   DUPON
PT0     TIME   KBTU/HR  TA                     FLOW SCFM                                                  FLOW SCFM                           SR (CUM)                             MEASURED
   OIL           CALC  SCFM                                                                 TEMP (F)                CORR TO 0% O2
                                                                                                                                                                        CORR TO 3% O2
(%)     LOAD     MEAS                          TEMP (F)                                            VELOCITY (FT/SEC)
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514  13:11:49  100.4 17099 2790  2062  2188  2128  2085  2455  1860  2423  2094  20084   2790  4517  4315  2062  2188  2128  2085     0.16  0.43  0.68  1.17     3.2  30.0  15.6 170.0 143.5 260.0
                                                                                          162   565   583   555   648   569   670                               0.0  35.4  18.4 200.6 169.3 306.7
  1    0.0     87.1          451   750   757   749   749   753   750   726   735           89    58    54   189   218   197   212                               3.0  30.3  15.8 171.9 145.1 262.9
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.10in H20   P WB(out) = 1.40in H20   DP(in) = 0.15in H20   DP(out) = 0.01in H20   FURN P = 0.10in H20   COAL P = 9.70in H2
   MILL=  164 F   EXIT= 1514 F   EXIT(sp)= 1063 F   SMPL= 1249 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 4.90   SORBENT AIR FLOW=  138  SCFM   [Ca]/[S]=  6.30
   VALID DATA POINT 0   8   ELAPSED TIME, MIN  15   RECORD ON TRK   0   FILE  78   LIMESTONE INJECTION-TERTS

561  13:37:42  100.6 17127 2921  2081  2215  2156  2114  2460  1868  2427  2097  20339   2921  4524  4328  2081  2215  2156  2114     0.17  0.43  0.69  1.19     3.4  30.0  15.0 160.0  66.0 550.0
                                                                                          163   560   579   586   654   615   673                               0.0  35.8  17.9 190.9  78.7 656.2
  0    0.0     87.1          435   740   746   740   741   744   740   719   727           94    58    54   196   222   209   216                               3.0  30.7  15.3 163.6  67.5 562.5
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.10in H20   P WB(out) = 1.40in H20   DP(in) = 0.15in H20   DP(out) = 0.01in H20   FURN P = 0.10in H20   COAL P = 9.70in H2
   MILL=  166 F   EXIT= 1456 F   EXIT(sp)= 1564 F   SMPL= 1205 F                     SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT 0   9   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  79   BASELINE

584  13:52:36   99.8 16984 2910  2089  2209  2146  2105  2461  1860  2422  2081  20282   2910  4503  4321  2089  2209  2146  2105     0.17  0.44  0.69  1.19     3.5  28.0  14.8 170.0 264.0 440.0
                                                                                          161   562   578   546   650   562   662                               0.0  33.6  17.8 204.0 316.8 520.0
  0    0.0     87.1          434   740   746   739   739   742   739   717   725           93    57    54   189   221   198   213                               3.0  28.8  15.2 174.9 271.5 452.6
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.10in H20   P WB(out) = 1.40in H20   DP(in) = 0.15in H20   DP(out) = 0.01in H20   FURN P = 0.10in H20   COAL P = 9.70in H20
   MILL=  164 F   EXIT= 1437 F   EXIT(sp)= 1580 F   SMPL= 1210 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 1.50   SORBENT AIR FLOW=  192  SCFM   [Ca]/[S]=  1.35
   VALID DATA POINT 0  10   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  80   LIMESTONE INJECTION

591  13:57:50  100.6 17133 2815  2107  2221  2155  2084  2467  1884  2420  2081  20234   2815  4501  4351  2107  2221  2155  2084     0.16  0.43  0.68  1.18     3.3  30.0  15.0 170.0 464.0 450.0
                                                                                          160   562   578   567   654   584   667                               0.0  35.6  17.8 201.7 550.5 533.9
  0    0.0     87.1          440   739   744   738   738   740   738   715   724           90    57    54   195   223   203   212                               3.0  30.5  15.3 172.9 471.9 457.6
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.10in H20   P WB(out) = 1.40in H20   DP(in) = 0.15in H20   DP(out) = 0.01in H20   FURN P = 0.10in H20   COAL P = 9.70in H20
   MILL=  162 F   EXIT= 1463 F   EXIT(sp)= 1570 F   SMPL= 1205 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 1.50   SORBENT AIR FLOW=   84  SCFM   [Ca]/[S]=  1.34
   VALID DATA POINT 0  11   ELAPSED TIME, MIN   3   RECORD ON TRK   0   FILE  81   0

604  14:04:59  100.5 17101 2875  2104  2224  2153  2093  2460  1863  2434  2094  20300   2875  4529  4331  2104  2224  2153  2093     0.17  0.43  0.69  1.19     3.4  30.0  15.0 170.0 166.0 500.0
                                                                                          160   565   580   567   657   587   667                               0.0  35.8  17.9 202.8 198.1 596.6
  0    0.0     87.1          440   740   746   739   739   742   730   717   725           92    58    54   195   224   203   213                               3.0  30.7  15.3 173.9 169.0 511.4
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.10in H20   P WB(out) = 1.40in H20   DP(in) = 0.15in H20   DP(out) = 0.01in H20   FURN P = 0.10in H20   COAL P = 9.70in H20
   MILL=  162 F   EXIT= 1453 F   EXIT(sp)= 1568 F   SMPL= 1213 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 1.50   SORBENT AIR FLOW=   49  SCFM   [Ca]/[S]=  1.34
   VALID DATA POINT 0  12   ELAPSED TIME, MIN   3   RECORD ON TRK   0   FILE  82   0

665  14:37:31  100.0 17156 2803  2146  2260  2265  2144  2534  1939  2604  2141  20836   2803  4745  4472  2146  2260  2265  2144     0.16  0.44  0.70  1.21     3.8  30.0  14.8 170.0 369.0 540.0
                                                                                          165   556   577   579   645   611   667                               0.0  36.6  18.1 207.6 450.5 659.3
  0    0.0     87.1          442   735   741   735   736   739   737   715   723           90    60    55   201   225   219   218                               3.0  31.4  15.5 177.9 386.2 565.1
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.10in H20   P WB(out) = 1.40in H20   DP(in) = 0.15in H20   DP(out) = 0.01in H20   FURN P = 0.10in H20   COAL P = 9.70in H20
   MILL=  170 F   EXIT= 1475 F   EXIT(sp)= 1513 F   SMPL= 1224 F                     SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT 0  13   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  83   BASELINE

706  14:59:59   99.7 16969 2750  2172  2061  2100  2162  2561  1972  2629  2200  20609   2750  4829  4534  2172  2061  2100  2162     0.16  0.45  0.71  1.21     3.8  25.0  14.6 180.0 320.5 330.0
                                                                                          168   564   580   595   659   623   673                               0.0  30.5  17.8 219.8 391.3 402.9
  0    0.0     83.5          439   732   738   731   733   736   733   713   720           89    62    56   206   208   205   221                               3.0  26.2  15.3 180.4 335.4 345.3
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.10in H20   P WB(out) = 1.20in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.02in H20   COAL P =11.40in H20
   MILL=  172 F   EXIT= 1463 F   EXIT(sp)= 1523 F   SMPL= 1236 F   SORBENT= VICRON   MILL INJECTION   SORBENT SPEED= 2.20   SORBENT AIR FLOW=  220  SCFM   [Ca]/[S]=  2.30
   VALID DATA POINT 0  14   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  84   LIMESTONE INJECTION
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DATE          :  07-13-83                                          TER DIA       :  8
SYSTEM        :  LWS                                               SPREADER      :  4"-4015
BURNER        :  RSC DMB                                           R.H./B.P.     :  66.0/29.52
FUEL          :  UTAH6                                             OIL CHECK     :  98.78
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                LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4   PRIM  SEC1  SEC2 TOTAL   O2    CO    CO2   NO    SO2   DUPONT
PT#   TIME   MBTU/HR  TA                          FLOW SCFM                                              FLOW SCFM                              SR (CUM)                        MEASURED
 OIL                CALC  SCFM                                                                 TEMP (F)              CORR TO 0% O2
(%)   LOAD   MEAS                                  TEMP (F)                                             VELOCITY (FT/SEC)                                                       CORR TO 3% O2
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716  15:08:37    99.8 16996 2699  2194  2072  2132  2180  2578  1977  2631  2181 20642   2699  4011  4555  2194  2072  2132  2180   0.16  0.44  0.71  1.21    3.8  28.0  14.8 170.0  833.5  520.0
                                                                                          167   555   573   577   647   611   666                              0.0  34.2  10.1 207.6 1017.6  634.9
 0     0.0    83.5             445   732   737   730   731   735   732   711   718          87    61    56   205   207   206   221                              3.0  29.3  15.5 177.9  872.3  544.2
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.10in H20   P WB(out) = 1.20in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.02in H20   COAL P =11.40in H20
   MILL=  171 F   EXIT= 1455 F   EXIT(sp)= 1520 F   SMPL= 1220 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  15   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  86   BASELINE

795  15:51:41   102.2 17398 2856  2180  2058  2125  2167  2565  1985  2648  2192 20777   2856  4840  4550  2180  2058  2125  2167   0.16  0.44  0.70  1.19    3.5  25.0  14.8 170.0  242.5  500.0
                                                                                          163   563   570   589   656   619   672                              0.0  30.0  17.8 204.0  291.0  600.0
 0     0.0    87.1             435   734   737   732   733   736   733   713   720          92    62    56   206   207   207   221   .                          3.0  25.7  15.2 174.9  249.4  514.3
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.10in H20   P WB(out) = 1.20in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.02in H20   COAL P =11.40in H20
   MILL=  167 F   EXIT= 1459 F   EXIT(sp)= 1528 F   SMPL= 1227 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  16   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  87   BASELINE

822  16:06:14    96.6 16440 2812  2185  2078  2123  2170  2572  2003  2652  2198 20793   2812  4850  4575  2185  2078  2123  2170   0.17  0.47  0.74  1.26    4.5  20.0  14.2 210.0 1167.5  200.0
                                                                                          160   564   578   583   652   610   666                              0.0  25.5  18.1 267.3 1485.9  254.5
 0     0.0    87.1             438   735   740   733   735   738   735   714   721          90    62    57   205   208   205   220                              3.0  21.8  15.5 229.1 1273.6  218.2
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.10in H20   P WB(out) = 1.20in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.02in H20   COAL P =11.40in H20
   MILL=  163 F   EXIT= 1460 F   EXIT(sp)= 1504 F   SMPL= 1238 F   SORBENT= VICRON   MILL INJECTION   SORBENT SPEED= 3.50   SORBENT AIR FLOW=  240  SCFM   [Ca]/[S]=  4.43
   VALID DATA POINT #  17   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  88   LIMESTONE INJECTION

829  16:13:36    99.5 16945 2703  2180  2075  2113  2157  2559  1969  2636  2188 20580   2703  4824  4528  2180  2075  2113  2157   0.16  0.44  0.71  1.21    3.8  20.0  14.6 180.0  247.0  450.0
                                                                                          159   566   581   583   657   611   671                              0.0  24.4  17.8 219.8  301.6  549.4
 0     0.0    87.1             443   735   740   734   736   739   735   715   723          86    62    56   205   209   204   220                              3.0  20.9  15.3 188.4  258.5  470.9
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.10in H20   P WB(out) = 1.20in H20   DP(in) = 0.20in H20   DP(out) =-0.10in H20   FURN P = 0.02in H20   COAL P =11.40in H20
   MILL=  162 F   EXIT= 1468 F   EXIT(sp)= 1522 F   SMPL= 1238 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  18   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  89   BASELINE
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DATE           :   07-14-83                        TER DIA       :   8
SYSTEM         :   LWS                             SPREADER      :   4"-4015
BURNER         :   RSC  DMB                        R.H./B.P.     :   74.0/29.52
FUEL           :   UTAH6                           OIL CHECK     :   97.19
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          LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2    CO    CO2    NO    SO2  DUPONT
PT#   TIME  MBTU/HR  TA                         FLOW SCFM                                            FLOW SCFM                             SR (CUM)                             MEASURED
 OIL              CALC  SCFM                                                              TEMP (F)              CORR TO 0% O2
(%)   LOAD        MEAS                          TEMP (F)                                            VELOCITY (FT/SEC)                                                     CORR TO 3% O2
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124  09:46:48  103.4  17596  2915   980   493     0     0  4229  4251  4551  3831  21250    2915  8382  8480   980   493     0     0    0.17  0.64  1.12  1.21    3.7  30.0  14.0  250.0    0.0    0.0
                                                                                            146   542   542   450   537   480   517                              0.0  36.4  17.0  303.5    0.0    0.0
  0    0.0     91.9          378   620   610   597   604   639   639   628   630              91   105   101    80    44     0     0                              3.0  31.2  14.6  260.1    0.0    0.0
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 0.00in H2O   P WB(out) = 0.00in H2O   DP(in) = 0.00in H2O   DP(out) = 0.00in H2O   FURN P = 0.00in H2O   COAL P = 0.00in H2O
   MILL=  144 F   EXIT= 1497 F   EXIT(sp)= 1394 F   SMPL= 1264 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   1   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  49   UNSTAGED

269  10:57:59   98.7  16808  2814  2155  2205  2142  2160  2438  2000  2831  1785  20530    2814  4616  4438  2155  2205  2142  2160    0.17  0.44  0.71  1.22    3.9  34.0  14.2  170.0  113.0  520.0
                                                                                            152   538   546   617   645   621   644                              0.0  41.8  17.4  208.8  138.8  638.6
  0    0.0     89.5          533   695   696   690   692   695   692   676   677              89    57    53   209   220   209   215                              3.0  35.8  14.9  178.9  118.9  547.4
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H2O   P WB(out) = 1.20in H2O   DP(in) = 0.10in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O   COAL P =10.00in H2O
   MILL=  158 F   EXIT= 1403 F   EXIT(sp)= 1512 F   SMPL= 1198 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   2   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  50   BASELINE

346  11:37:09  100.5  17115  2546  2142  2214  2135  2162  2435  2137  2910  1757  20439    2546  4667  4573  2142  2214  2135  2162    0.15  0.42  0.69  1.19    3.5  35.0  15.0  170.0  306.0  560.0
                                                                                            147   536   546   569   625   595   644                              0.0  42.0  18.0  204.0  367.2  672.0
  0    0.0     90.7          430   707   710   702   705   708   707   688   689              80    58    55   199   216   203   215                              3.0  36.0  15.4  174.9  314.7  576.0
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H2O   P WB(out) = 1.20in H2O   DP(in) = 0.10in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O   COAL P =10.00in H2O
   MILL=  147 F   EXIT= 1461 F   EXIT(sp)= 1407 F   SMPL= 1221 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   3   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  51   BASELINE

381  11:46:49  100.5  17109  2548  2143  2192  2117  2159  2445  2109  2871  1735  20318    2548  4606  4553  2143  2192  2117  2159    0.15  0.42  0.68  1.19    3.4  33.0  15.0  160.0  160.0  420.0
                                                                                            147   543   550   572   627   598   646                              0.0  39.4  17.9  190.9  190.9  501.1
  0    0.0     90.7          358   710   714   706   709   711   709   691   693              80    58    55   199   215   202   215                              3.0  33.8  15.3  163.6  163.6  429.5
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H2O   P WB(out) = 1.20in H2O   DP(in) = 0.10in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O   COAL P =10.00in H2O
   MILL=  146 F   EXIT= 1492 F   EXIT(sp)= 1539 F   SMPL= 1248 F   SORBENT= VICRON   MILL INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  179  SCFM   [Ca]/[S]=  0.87
   VALID DATA POINT #   4   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  52   LIMESTONE INJECTION

429  12:20:10  100.5  17114  2579  2131  2230  2145  2160  2483  2105  2867  1738  20437    2579  4605  4588  2131  2230  2145  2160    0.15  0.42  0.69  1.19    3.5  32.0  14.8  165.0  363.0  545.0
                                                                                            139   539   543   560   625   589   646                              0.0  38.4  17.8  198.0  435.6  654.0
  0    0.0     90.7          347   714   718   708   712   717   714   693   695              80    57    55   196   218   203   215                              3.0  32.9  15.2  169.7  373.4  560.6
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H2O   P WB(out) = 1.20in H2O   DP(in) = 0.10in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O   COAL P =10.00in H2O
   MILL=  136 F   EXIT= 1472 F   EXIT(sp)= 1520 F   SMPL= 1231 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   5   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  53   BASELINE

462  12:36:27  101.1  17211  2515  2142  2218  2110  2152  2470  2107  2872  1740  20326    2515  4612  4577  2142  2218  2110  2152    0.15  0.41  0.68  1.18    3.3  30.0  15.4  170.0  997.0  350.0
                                                                                            151   539   543   575   626   604   650                              0.0  35.6  18.3  201.7 1182.9  415.3
  0    0.0     90.7          452   707   712   703   708   713   709   691   692              79    57    55   200   217   202   215                              3.0  30.5  15.7  172.9 1013.9  355.9
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H2O   P WB(out) = 1.20in H2O   DP(in) = 0.10in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O   COAL P =10.00in H2O
   MILL=  155 F   EXIT= 1481 F   EXIT(sp)= 1529 F   SMPL= 1247 F   SORBENT= VICRON   MILL INJECTION   SORBENT SPEED= 2.60   SORBENT AIR FLOW=  160  SCFM   [Ca]/[S]: 1.81
   VALID DATA POINT #   6   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  54   LIMESTONE INJECTION

480  12:54:48   98.7  16798  2804  2168  2224  2163  2150  2456  2118  2868  1725  20676    2804  4593  4573  2168  2224  2163  2150    0.17  0.44  0.71  1.23    4.0  30.0  14.4  175.0    0.0  500.0
                                                                                            145   537   547   548   620   578   638                              0.0  37.1  17.8  216.6    0.0  618.9
  0    0.0     90.7          345   713   716   710   714   718   714   695   696              87    57    55   197   217   202   213                              3.0  31.8  15.3  185.7    0.0  530.5
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H2O   P WB(out) = 1.20in H2O   DP(in) = 0.10in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O   COAL P =10.00in H2O
   MILL=  142 F   EXIT= 1411 F   EXIT(sp)= 1482 F   SMPL= 1193 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   7   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  55   BASELINE
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DATE          :   07-14-83                        TER DIA       :   8
SYSTEM        :   LWS                             SPREADER      :   4"-4015
BURNER        :   RSC  DMB                        R.H./B.P.     :   64.0/29.52
FUEL          :   UTAH6                           OIL CHECK     :   97.19
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               LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2 TOTAL    O2    CO   CO2    NO   SO2 DUPONT
PT#    TIME   MBTU/HR  TA                         FLOW SCFM                                                  FLOW SCFM                         SR (CUM)                               MEASURED
 OIL           CALC  SCFM                                                                  TEMP (F)                CORR TO 0% O2
(%)   LOAD     MEAS                                TEMP (F)                                            VELOCITY (FT/SEC)                                                         CORR TO 3% O2
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561  13:32:27  100.7 17136 2503  2223  2258  2219  2244  2568  2185  2937  1796 20931     2503  4732  4753  2223  2258  2219  2244    0.15  0.42  0.70  1.22    3.9  25.0  15.0 185.0   0.0 240.0
                                                                                          166   510   527   541   611   563   623                              0.0  30.7  18.4 227.2   0.0 294.7
 0    0.0     85.9          563   702   706   694   696   703   698   681   676            81    58    56   200   210   205   219                              3.0  26.3  15.8 194.7   0.0 252.6
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.20in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.00in H20
   MILL=  174 F   EXIT= 1502 F   EXIT(sp)= 1528 F   SMPL= 1271 F   SORBENT= VICRON   MILL INJECTION   SORBENT SPEED= 3.30   SORBENT AIR FLOW=  139  SCFM   [Ca]/[S]=  2.92
   VALID DATA POINT #  8   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  56   LIMESTONE INJECTION

599  13:55:00  101.5 17276 2747  2197  2265  2200  2232  2544  2167  2938  1813 21101     2747  4751  4711  2197  2265  2200  2232    0.16  0.43  0.71  1.22    3.9  36.0  14.6 180.0 280.5 520.0
                                                                                          154   570   575   586   656   611   672                              0.0  44.2  17.9 221.1 344.5 638.6
 0    0.0     85.9          367   742   746   739   740   744   742   722   721            87    61    58   207   220   212   228                              3.0  37.9  15.4 189.5 295.3 547.4
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.20in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.00in H20
   MILL=  153 F   EXIT= 1451 F   EXIT(sp)= 1517 F   SMPL= 1233 F            SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  9   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  57   BASELINE

629  14:10:21   99.9 17011 2680  2213  2272  2201  2220  2543  2164  2922  1803 21018     2680  4724  4708  2213  2272  2201  2220    0.16  0.44  0.71  1.24    4.1  24.0  14.4 190.0 579.5 400.0
                                                                                          156   569   575   591   650   614   672                              0.0  29.8  17.9 236.1 720.1 497.0
 0    0.0     85.9          457   740   753   745   745   751   747   726   727            85    61    58   210   229   213   226                              3.0  25.6  15.3 202.4 617.2 426.0
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.20in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.00in H20
   MILL=  159 F   EXIT= 1491 F   EXIT(sp)= 1513 F   SMPL= 1272 F   SORBENT= Ca(OH)2   MILL INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  200  SCFM   [Ca]/[S]=  1.11
   VALID DATA POINT #  10   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  58   LIME INJECTION

652  14:24:54  100.7 17139 2558  2191  2261  2202  2197  2528  2163  2926  1790 20815     2558  4716  4691  2191  2261  2202  2197    0.15  0.42  0.70  1.21    3.8  30.0  15.0 185.0 389.5 440.0
                                                                                          159   574   580   583   663   614   676                              0.0  36.6  18.3 225.9 475.6 537.2
 0    0.0     89.5          525   746   750   744   743   749   745   725   727            81    61    58   206   229   213   225                              3.0  31.4  15.7 193.6 407.6 460.5
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.20in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.00in H20
   MILL=  164 F   EXIT= 1491 F   EXIT(sp)= 1519 F   SMPL= 1269 F   SORBENT= Ca(OH)2   MILL INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  200  SCFM   [Ca]/[S]=  1.10
   VALID DATA POINT #  11   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  59   LIME INJECTION

668  14:34:06  101.1 17213 2525  2184  2242  2163  2202  2519  2124  2917  1795 20670     2525  4712  4642  2184  2242  2163  2202    0.15  0.42  0.69  1.20    3.6  30.0  14.8 175.0 468.5 560.0
                                                                                          159   579   582   605   669   633   685                              0.0  36.2  17.9 211.2 565.4 675.9
 0    0.0     90.7          527   746   750   743   744   749   745   725   727            80    61    58   210   228   213   227                              3.0  31.0  15.3 181.0 484.7 579.3
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.01in H20   COAL P =10.20in H20
   MILL=  164 F   EXIT= 1475 F   EXIT(sp)= 1522 F   SMPL= 1247 F            SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  12   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  60   BASELINE

691  14:44:52  102.0 17371 2528  2179  2239  2164  2176  2506  2134  2903  1799 20629     2528  4702  4640  2179  2239  2164  2176    0.15  0.42  0.68  1.19    3.4  26.0  15.2 185.0 761.5 390.0
                                                                                          160   578   581   594   665   623   680                              0.0  31.0  18.1 220.7 908.6 465.3
 0    0.0     90.7          533   745   749   743   744   748   745   725   727            81    61    58   207   227   211   224                              3.0  26.6  15.5 189.2 778.8 398.1
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.01in H20   COAL P =10.20in H20
   MILL=  165 F   EXIT= 1522 F   EXIT(sp)= 1541 F   SMPL= 1277 F   SORBENT= Ca(OH)2   MILL INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  184  SCFM   [Ca]/[S]=  1.00
   VALID DATA POINT #  13   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  61   LIME INJECTION

738  15:13:50  101.4 17260 2478  2149  2196  2124  2160  2495  2128  2893  1762 20384     2478  4655  4623  2149  2196  2124  2160    0.14  0.41  0.68  1.18    3.3  30.0  15.2 170.0   0.0 520.0
                                                                                          164   573   581   645   678   658   691                              0.0  35.6  18.0 201.7   0.0 616.9
 0    0.0     90.7          566   750   754   746   749   753   751   731   733            80    60    57   214   225   214   224                              3.0  30.5  15.5 172.9   0.0 528.0
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.01in H20   COAL P =10.20in H20
   MILL=  171 F   EXIT= 1484 F   EXIT(sp)= 1529 F   SMPL= 1245 F            SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  14   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  62   BASELINE
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DATE       :   07-14-83                                      TER DIA        :   8
SYSTEM     :   LWS                                           SPREADER       :   4"-4019
BURNER     :   RSC DMB                      ;                R.H./B.P.      :   64.0/29.52
FUEL       :   UTAH6                                         OIL CHECK      :   97.19

             LOAD         PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4   PRIM  SEC1  SEC2  TOTAL   O2    CO    CO2    NO    SO2   DUPONT
PT#   TIME  MBTU/HR  TA                             FLOW SCFM                                           FLOW SCFM                           SR (CUM)                               MEASURED
  OIL         CALC  SCFM                                                                 TEMP (F)            CORR TO 0% O2
(%)   LOAD    MEAS                                  TEMP (F)                                      VELOCITY (FT/SEC)                                                      CORR TO 3% O2

773  15:30:56   101.5 17272 2444  2155  2183  2137  2152  2471  2129  2877  1738 20286   2444  4616  4600  2155  2183  2137  2152   0.14  0.41  0.68  1.17    3.2  30.0  15.4  190.0  574.5  320.0
                                                                                          166   571   582   648   682   662   692                              0.0  35.4  18.2  224.2  677.8  377.5
  0    0.0    90.7        577   749   755   745   747   751   749   730   732              79    59    57   215   225   216   223                              3.0  30.3  15.6  192.1  581.0  323.6
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.01in H20   COAL P =10.20in H20
   MILL=  174 F   EXIT= 1526 F   EXIT(sp)= 1567 F   SMPL= 1288 F   SORBENT= Ca(OH)2   MILL INJECTION   SORBENT SPEED= 3.00   SORBENT AIR FLOW=  159  SCFM   [Ca]/[S]=  2.89
   VALID DATA POINT #  15   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  63   LIME INJECTION

797  15:46:49   100.3 17072 2575  2154  2179  2111  2148  2467  2129  2873  1752 20387   2575  4626  4595  2154  2179  2111  2148   0.15  0.42  0.69  1.19    3.5  32.0  15.2  170.0    0.0  540.0
                                                                                          173   576   582   607   671   602   681                              0.0  38.4  18.2  204.0    0.0  640.0
  0    0.0    89.5        583   751   754   746   748   752   750   731   732              84    60    57   207   222   202   221                              3.0  32.9  15.6  174.9    0.0  555.4
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.01in H20   COAL P =10.20in H20
   MILL=  183 F   EXIT= 1485 F   EXIT(sp)= 1541 F   SMPL= 1253 F            SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  16   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  64   BASELINE

823  15:58:21   102.8 17495 2546  2161  2215  2148  2147  2467  2123  2875  1753 20436   2546  4628  4591  2161  2215  2148  2147   0.15  0.41  0.67  1.17    3.1  35.0  15.4  170.0  522.0  380.0
                                                                                          176   573   582   557   657   585   677                              0.0  41.1  18.1  199.4  612.4  445.8
  0    0.0    89.5        590   749   752   745   746   749   747   728   731              83    60    57   198   223   202   220                              3.0  35.2  15.5  170.9  524.9  382.1
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.01in H20   COAL P =10.20in H20
   MILL=  104 F   EXIT= 1536 F   EXIT(sp)= 1568 F   SMPL= 1276 F   SORBENT= Ca(OH)2   TERT INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  163  SCFM   [Ca]/[S]=  1.00
   VALID DATA POINT #  17   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  65   LIME INJECTION

837  16:10:14   101.6 17299 2550  2135  2202  2144  2158  2453  2131  2877  1781 20430   2550  4658  4584  2135  2202  2144  2158   0.15  0.42  0.68  1.18    3.3  35.0  15.2  170.0  315.5  540.0
                                                                                          176   566   574   576   658   589   672                              0.0  41.5  18.0  201.7  374.3  640.7
  0    0.0    89.5        593   746   751   741   742   747   745   726   727              83    60    57   199   222   203   220                              3.0  35.6  15.5  172.9  320.8  549.2
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.01in H20   COAL P =10.20in H20
   MILL=  104 F   EXIT= 1495 F   EXIT(sp)= 1553 F   SMPL= 1268 F            SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  18   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  66   BASELINE

871  16:28:16   100.9 17174 2587  2151  2215  2141  2172  2472  2136  2886  1750 20509   2587  4636  4609  2151  2215  2141  2172   0.15  0.42  0.69  1.19    3.5  30.0  15.0  170.0  460.0  300.0
                                                                                          176   562   568 , 566   654   574   666                              0.0  36.0  18.0  204.0  552.0  360.0
  0    0.0    87.1        600   739   743   734   735   739   738   719   721              85    59    57   199   222   199   220                              3.0  30.9  15.4  174.9  473.1  308.6
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.01in H20   COAL P =10.20in H20
   MILL=  185 F   EXIT= 1499 F   EXIT(sp)= 1554 F   SMPL= 1257 F   SORBENT= Ca(OH)2   TERT INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  150  SCFM   [Ca]/[S]=  1.90
   VALID DATA POINT #  19   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  67   LIME INJECTION

891  16:36:56   104.5 17794 2547  2154  2199  2140  2157  2475  2146  2882  1752 20452   2547  4633  4621  2154  2199  2140  2157   0.14  0.40  0.66  1.15    2.8  30.0  15.4  165.0  430.5  240.0
                                                                                          177   551   559   560   644   569   661                              0.0  34.6  17.8  190.4  496.7  276.9
  0    0.0    87.1        599   736   740   731   732   736   734   717   718              83    58    56   198   219   198   218                              3.0  29.7  15.2  163.2  425.8  237.4
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.01in H20   COAL P =10.20in H20
   MILL=  187 F   EXIT= 1530 F   EXIT(sp)= 1573 F   SMPL= 1297 F   SORBENT= Ca(OH)2   TERT INJECTION   SORBENT SPEED= 3.00   SORBENT AIR FLOW=  132  SCFM   [Ca]/[S]=  2.81
   VALID DATA POINT #  20   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  68   LIME INJECTION

917  16:54:41   101.9 17349 2580  2159  2203  2138  2152  2472  2135  2881  1769 20489   2580  4650  4607  2159  2203  2138  2152   0.15  0.42  0.60  1.18    3.3  30.0  15.0  170.0  437.5  500.0
                                                                                          176   557   562   570   655   578   665                              0.0  35.6  17.8  201.7  519.1  593.2
  0    0.0    85.9        601   733   737   728   730   733   732   713   714              84    59    56   200   221   200   218                              3.0  30.5  15.3  172.9  444.9  508.5
   NOZZLE =  -2 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.01in H20   COAL P =10.20in H20
   MILL=  188 F   EXIT= 1514 F   EXIT(sp)= 1575 F   SMPL= 1291 F            SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  21   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  69   BASELINE
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DATE          :   07-14-83                        TER DIA       :   8
SYSTEM        :   LWS                             SPREADER      :   4"-4015
BURNER        :   RSC  DMB                        R.H./B.P.     :   64.0/29.52
FUEL          :   UTAH6                           OIL CHECK     :   97.19
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            LOAD         PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4   PRIM  SEC1  SEC2 TOTAL   O2    CO    CO2    NO    SO2  DUPONT
PT#   TIME  MBTU/HR TA                       FLOW SCFM                                                    FLOW SCFM                        SR (CUM)                      MEASURED
 OIL        CALC  SCFM                                                                 TEMP (F)              CORR TO 0% O2
(%)   LOAD  MEAS                             TEMP (F)                                          VELOCITY (FT/SEC)                                                  CORR TO 3% O2
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127  17:03:24   99.7 16976 2597  2161  2195  2152  2185  2497  2139  2904  1787 20617   2597  4691  4636  2161  2195  2152  2185   0.15  0.43  0.70  1.21    3.8  28.0  15.4  175.0  300.5  350.0
                                                                                         176   554   562   582   648   580   661                                0.0  34.2  18.8  213.7  366.9  427.1
  0    0.0   85.9         600   731   735   726   728   731   729   711   713             85    59    57   203   219   202   221                                3.0  29.3  16.1  183.1  314.5  366.3
   NOZZLE = -2 in   SPREADER = -6 in   IN REG = 20 DEG   OUT REG = 20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.01in H20   COAL P =10.20in H20
   MILL= 106 F   EXIT= 1497 F   EXIT(sp)= 1540 F   SMPL= 1270 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 2.60   SORBENT AIR FLOW= 141 SCFM   [Ca]/[S]= 1.80
   VALID DATA POINT # 22   ELAPSED TIME, MIN  6   RECORD ON TRK  0   FILE 70   LIMESTONE INJECTION
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DATE       :  07-15-83                              TER DIA       :  8
SYSTEM     :  LWS                                   SPREADER      :  4"-4@15
BURNER     :  RSC  DMB                              R.H./B.P.     :  68.0/29.63
FUEL       :  INDIANA4                              OIL  CHECK    :  96.64
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              LOAD         PRIM  V -2   V -3   V -4   V -5  V -6   V -7   V -8   V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2 TOTAL    O2    CO    CO2    NO    SO2  DUPONT
PT#   TIME  MBTU/HR  TA                           FLOW SCFM                                                   FLOW SCFM                      SR (CUM)                            MEASURED
 OIL           CALC  SCFM                                                                      TEMP (F)            CORR TO 0% O2
(%)  LOAD      MEAS                               TEMP (F)                                               VELOCITY (FT/SEC)                                                 CORR TO 3% O2
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212  11:11:29    98.6 17081 2495   869    548      0      0   3777   4284   4398   4034 20405    2495  8432  8060   869   548     0     0    0.15  0.64  1.11  1.19     3.5  32.0  15.2  300.0  972.5 2100.0
                                                                                                 148   564   564   467   538   477   496                             0.0  38.4  18.2  360.0 1167.0 2520.0
 0     0.0     103.5           621    648    642    617    621    680    682    668    670       78   108    99    73    49     0     0                             3.0  32.9  15.6  308.6 1000.3 2160.0
   NOZZLE =  -2 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 4.10in H20    P WB(out) = 4.70in H20    DP(in) = 0.02in H20    DP(out) =-0.02in H20    FURN P = 0.02in H20    COAL P =10.30in H20
   MILL=  140 F   EXIT= 1585 F   EXIT(sp)= 1782 F   SMPL= 1305 F            SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   1   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  91   UNSTAGED

267  11:43:32   100.9 17404 2608  1199   1252   1236   1324   3420   3298   3562   3105 21003    2608  6666  6710  1199  1252  1236  1324    0.15  0.53  0.91  1.20     3.6  42.0  15.2  200.0  304.0 2150.0
                                                                                                 151   562   565   551   588   560   609                             0.0  50.7  18.3  241.4  366.9 2594.8
 0     0.0     101.2           634    676    685    672    670    695    695    679    683       82    85    82   109   118   114   127                             3.0  43.4  15.7  206.9  314.5 2224.1
   NOZZLE =  -2 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 4.10in H20    P WB(out) = 4.70in H20    DP(in) = 0.02in H20    DP(out) =-0.02in H20    FURN P = 0.02in H20    COAL P =10.30in H20
   MILL=  155 F   EXIT= 1520 F   EXIT(sp)= 1669 F   SMPL= 1295 F            SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   2   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  92   INTERMEDIATE STAGING

289  11:56:33   103.5 17926 2563  1177   1234   1262   1339   3371   3157   3542   3076 20720    2563  6618  6520  1177  1234  1262  1339    0.14  0.51  0.88  1.16     2.9  50.0  15.6  180.0    0.0 2400.0
                                                                                                 154   578   584   549   596   576   623                             0.0  58.0  18.1  208.8    0.0 2784.5
 0     0.0     101.2           642    691    700    688    695    711    712    695    700       81    86    81   107   117   110   131                             3.0  49.7  15.5  179.0    0.0 2386.7
   NOZZLE =  -2 in    SPREADER =  -2 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 4.10in H20    P WB(out) = 4.70in H20    DP(in) = 0.02in H20    DP(out) =-0.02in H20    FURN P = 0.02in H20    COAL P =10.30in H20
   MILL=  156 F   EXIT= 1684 F   EXIT(sp)= 1796 F   SMPL= 1320 F            SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   3   ELAPSED TIME, MIN   3   RECORD ON TRK   0   FILE  93   SPREADER RETRACTION

335  12:24:06   103.5 17929 2480  1183   1214   1211   1272   3555   3177   3922   3276 21299    2480  7199  6732  1183  1214  1211  1272    0.14  0.54  0.92  1.19     3.4  35.0  15.6  230.0  655.0 2100.0
                                                                                                 157   577   590   534   602   578   631                             0.0  41.8  18.6  274.4  781.5 2505.7
 0     0.0      97.7           645    699    707    696    704    720    719    703    709       79    93    84   106   116   113   125                             3.0  35.8  16.0  235.2  669.9 2147.1
   NOZZLE =  -3 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 4.10in H20    P WB(out) = 4.70in H20    DP(in) = 0.02in H20    DP(out) =-0.02in H20    FURN P = 0.02in H20    COAL P =10.30in H20
   MILL=  161 F   EXIT= 1561 F   EXIT(sp)= 1710 F   SMPL= 1329 F            SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   4   ELAPSED TIME, MIN   4   RECORD ON TRK   0   FILE  94   NOZZLE RETRACTION--(-2.5)

561  14:20:36    90.5 17065 2445  1259   1285   1338   1352   3432   3172   3504   3184 20971    2445  6600  6605  1259  1285  1338  1352    0.14  0.54  0.92  1.23     4.0  30.0  14.6  260.0  627.5 2050.0
                                                                                                 153   539   546   522   566   538   584                             0.0  37.1  18.0  321.2  775.1 2532.4
 0     0.0      96.6           600    650    664    651    650    673    672    657    663       77    83    79   111   119   120   127                             3.0  31.8  15.5  275.3  664.4 2170.6
   NOZZLE =  -3 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 4.10in H20    P WB(out) = 4.70in H20    DP(in) = 0.02in H20    DP(out) =-0.02in H20    FURN P = 0.02in H20    COAL P =10.30in H20
   MILL=  157 F   EXIT= 1559 F   EXIT(sp)= 1684 F   SMPL= 1331 F            SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   5   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  95   INTERMEDIATE STAGING

601  14:41:22   102.7 17707 2524  1655   1749   1796   2107   3073   2389   3053   2438 20784    2524  5492  5461  1655  1749  1796  2107    0.14  0.45  0.76  1.17     3.1  30.0  15.2  150.0   95.5 2400.0
                                                                                                 161   536   549   532   595   569   618                             0.0  35.2  17.8  176.0  112.0 2815.6
 0     0.0      96.6           621    679    686    673    680    688    686    668    675       81    68    66   148   166   166   205                             3.0  30.2  15.3  150.8   96.0 2413.4
   NOZZLE =  -4 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 4.10in H20    P WB(out) = 4.70in H20    DP(in) = 0.02in H20    DP(out) =-0.02in H20    FURN P = 0.02in H20    COAL P = 9.60in H20
   MILL=  165 F   EXIT= 1476 F   EXIT(sp)=  912 F   SMPL= 1264 F            SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   6   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  96   INTERMEDIATE STAGING

636  15:04:33   107.0 18539 2447  1616   1720   1752   2062   2056   1670   4393   3705 21429    2447  8090  3734  1616  1720  1752  2062    0.13  0.57  0.77  1.16     2.9  30.0  15.6  210.0    0.0 2100.0
                                                                                                 160   523   578   554   609   582   629                             0.0  34.0  18.1  243.6    0.0 2436.5
 0     0.0      96.6           620    684    689    677    684    690    680    679    685       78    99    46   148   166   164   202                             3.0  29.8  15.5  208.8    0.0 2088.4
   NOZZLE =  -4 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 4.10in H20    P WB(out) = 4.70in H20    DP(in) = 0.02in H20    DP(out) =-0.02in H20    FURN P = 0.02in H20    COAL P = 9.60in H20
   MILL=  166 F   EXIT= 1544 F   EXIT(sp)=  701 F   SMPL= 1321 F            SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   7   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  97   BIAS TO INNER REGISTER(60%)
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DATE              :    07-18-83                                    TER DIA           :    0
SYSTEM            :    LWS                                         SPREADER          :    4"-4@15
BURNER            :    RSC  DMB                                    R.H./B.P.         :    62/29.4
FUEL              :    INDIANA4                                    OIL CHECK         :    95.51
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              LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2 TOTAL     O2    CO    CO2   NO    SO2  . DUPONT
PT#    TIME  MBTU/HR  TA                             FLOW SCFM                                              FLOW SCFM                         SR (CUM)                               MEASURED
  OIL          CALC  SCFM                                                                   TEMP (F)              CORR TO 0% O2
(%)   LOAD     MEAS                                  TEMP (F)                                           VELOCITY (FT/SEC)                                                       CORR TO 3% O2
------------------------------------------------------------------------------------------------------------------------------------------------------------------

240  09:56:02  102.0 17812 2596   965   301     0     0  4030  4395  4440  4079 20813    2596  8527  8424   965   301     0     0    0.15  0.62  1.10  1.17     3.1  30.0   7.7 375.0 1282.5 2200.0
                                                                                          142   525   523   399   513   409   471                              0.0  35.2   9.0 439.9 1504.6 2501.0
  0    0.0     80.5         580   596   576   558   575   622   624   613   614            80   105    99    75    26     0     0                              3.0  30.2   7.7 377.1 1289.7 2212.3
    NOZZLE =  -3 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 0.00in H20    P WB(out) = 0.00in H20    DP(in) = 0.00in H20    DP(out) = 0.00in H20    FURN P = 0.00in H20    COAL P = 0.00in H20
    MILL=  146 F   EXIT= 1615 F   EXIT(sp)= 1006 F   SMPL= 1319 F          SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #   1   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  98

610  13:03:37   98.7 17101 2423  1790  1727  1755  1818  2912  2977  2587  3027 21015    2423  5614  5089  1790  1727  1755  1818    0.14  0.47  0.81  1.23     4.0  30.0  14.6 170.0  337.5 1950.0
                                                                                          159   577   575   545   620   584   646                              0.0  37.1  18.0 210.0  416.9 2408.8
  0    0.0     80.5         790   713   717   707   714   722   721   697   709            77    73    73   162   160   165   181                              3.0  31.8  15.5 180.0  357.4 2064.7
    NOZZLE =  -3 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.40in H20    P WB(out) = 1.40in H20    DP(in) =-0.10in H20    DP(out) =-0.01in H20    FURN P =-0.04in H20    COAL P =10.20in H20
    MILL=  162 F   EXIT= 1455 F   EXIT(sp)=  765 F   SMPL= 1273 F          SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #   2   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  99

730  14:06:11  100.7 17450 2436  1483  1524  1256  1678  3387  3308  3050  3322 21444    2436  6372  6695  1483  1524  1256  1678    0.14  0.50  0.89  1.23     4.0  33.0  14.6 240.0  477.5 2000.0
                                                                                          150   543   543   498   563   520 10032                              0.0  40.8  18.0 296.5  589.9 2470.6
  0    0.0     80.5         807   658   664   648   661   676   676   656   662            77    80    80   120   140   111  2795                              3.0  34.9  15.5 254.1  505.6 2117.1
    NOZZLE =  -3 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.40in H20    P WB(out) = 1.40in H20    DP(in) =-0.10in H20    DP(out) =-0.01in H20    FURN P =-0.04in H20    COAL P =10.20in H20
    MILL=  152 F   EXIT= 1547 F   EXIT(sp)=  831 F   SMPL= 1345 F          SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #   3   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 100

826  14:58:15  103.7 17965 2504  1259  1243  1138  1213  3698  3819  3719  3742 22335    2504  7461  7518  1259  1243  1138  1213    0.14  0.55  0.97  1.24     4.2  25.0  14.4 300.0  740.0 2000.0
                                                                                          153   533   646   594   653   483 10032                              0.0  31.3  18.0 375.0  925.0 2500.0
  0    0.0     80.5         704   625   631   614   625   650   649   632   635            79    92    99   120   125    97  2020                              3.0  26.8  15.4 321.4  792.9 2142.1
    NOZZLE =  -3 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.40in H20    P WB(out) = 1.40in H20    DP(in) =-0.10in H20    DP(out) =-0.01in H20    FURN P =-0.04in H20    COAL P =10.20in H20
    MILL=  157 F   EXIT= 1639 F   EXIT(sp)=  855 F   SMPL= 1401 F          SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #   4   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE 101

863  15:13:15  100.3 17387 2482   872   262     0     0  4158  4615  4388  4229 21005    2482  8617  8772   872   262     0     0    0.14  0.64  1.14  1.21     3.7  22.0  14.8 420.0 1565.5 2100.0
                                                                                          148   577   573   425   542   454 10032                              0.0  26.7  18.0 509.8 1900.3 2549.1
  0    0.0     80.5         727   788   636   733   638   692   690   675   677            78   111   108    70    24     0     0                              3.0  22.9  15.4 437.0 1628.8 2185.0
    NOZZLE =  -3 in    SPREADER =  -6 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.40in H20    P WB(out) = 1.40in H20    DP(in) =-0.10in H20    DP(out) =-0.01in H20    FURN P =-0.04in H20    COAL P =10.20in H20
    MILL=  154 F   EXIT= 1672 F   EXIT(sp)=  8[illegible] F   SMPL= 1378 F     SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #   5   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE 102   UNSTAGED-GRAB SAMPLE
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DATE      :  07-19-83                      TER DIA      :  8
SYSTEM    :  LWS                           SPREADER     :  4"-4020
BURNER    :  RS                            R.H./B.P.    :  61/29.5
FUEL      :  INDIANA4                      OIL CHECK    :  95.31
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              LOAD          PRIM  V-2   V-3   V-4   V-5   V-6   V-7   V-8   V-9   TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4   PRIM  SEC1  SEC2  TOTAL   O2    CO   CO2   NO    SO2   DUPONT
PT#    TIME   MBTU/HR TA                          FLOW SCFM                                             FLOW SCFM                           SR (CUM)                            MEASURED
 OIL          CALC  SCFM                                                                 TEMP (F)                 CORR TO 0% O2
(%)    LOAD   MEAS                                TEMP (F)                                          VELOCITY (FT/SEC)                                                     CORR TO 3% O2
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380  13:34:51   95.2 16497 2551  587   196     0     0  4380  4262  4062  4236  20274   2551  8297  8642   587   196     0     0   0.15  0.66  1.18  1.23    4.0  30.0  14.6  400.0 1969.5 1800.0
                                                                                          171   564   566   406   494   453 10032                              0.0  37.1  18.0  494.1 2432.9 2223.5
  0    0.0     74.7         780   636   617   616   630   686   685   669   673            83   106   106    46    17     0     0                              3.0  31.0  15.5  423.5 2085.4 1905.9
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 5.80in H2O   P WB(out) = 6.00in H2O   DP(in) = 0.40in H2O   DP(out) =-0.30in H2O   FURN P = 0.10in H2O   COAL P =10.00in H2O
   MILL=  179 F   EXIT= 1591 F   EXIT(sp)= 1790 F   SMPL= 1364 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  1   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE 103   UNSTAGED

453  14:12:05   92.9 16090 2562  1262  1193  1048  1113  2965  3006  3052  3030  19231   2562  6081  5971  1262  1193  1048  1113   0.16  0.54  0.91  1.19    3.5  33.0  15.0  270.0 1377.5 1900.0
                                                                                          172   543   554   482   556   518 10032                              0.0  39.6  18.0  324.0 1653.0 2280.0
  0    0.0     72.4         789   684   691   677   688   707   705   681   691            83    76    72   107   109    92  1055                              3.0  33.9  15.4  277.7 1416.9 1954.3
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 5.80in H2O   P WB(out) = 6.00in H2O   DP(in) = 0.40in H2O   DP(out) =-0.30in H2O   FURN P = 0.10in H2O   COAL P =10.00in H2O
   MILL=  179 F   EXIT= 1569 F   EXIT(sp)=  802 F   SMPL= 1329 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  2   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 104   INTERMEDIATE STAGING

498  14:33:15   98.2 17013 2575  2149  2053  2144  2067  2352  2049  2364  2102  19934   2575  4546  4400  2149  2053  2144  2067   0.15  0.42  0.68  1.17    3.2  32.0  15.4  190.0 1022.0 2050.0
                                                                                          172   542   552   561   638   595 10032                              0.0  37.6  18.1  223.5 1202.4 2411.8
  0    0.0     72.4         805   719   721   712   716   727   722   694   706            84    57    53   198   203   204  3443                              3.0  32.3  15.5  191.6 1030.6 2067.2
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.20in H2O   P WB(out) = 1.50in H2O   DP(in) = 0.20in H2O   DP(out) =-0.10in H2O   FURN P = 0.01in H2O   COAL P =10.00in H2O
   MILL=  103 F   EXIT= 1567 F   EXIT(sp)=  803 F   SMPL= 1294 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  3   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE 105   STAGED - FINAL
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DATE            :   07-20-83                         TER DIA       :   8
SYSTEM          :   LWS                              SPREADER      :   4"-4@20
BURNER          :   RSC DMB                          R.H./B.P.     :   56/29.6
FUEL            :   INDIANA4                         OIL CHECK     :   94.98

                LOAD       PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL     O2    CO    CO2    NO     SO2   DUPONT
PT0    TIME   MBTU/HR  TA                            FLOW SCFM                                              FLOW SCFM                     SR (CUM)                                  MEASURED
  OIL          CALC  SCFM                                                                  TEMP (F)             CORR TO 0% O2
(%)    LOAD    MEAS                                   TEMP (F)                                           VELOCITY (FT/SEC)                                                 CORR TO 3% O2

 194  10:41:17   98.5 17070 2543   583   484     0     0  4095  4457  4459  4238 20858    2543  8697  8552   583   484     0     0    0.15  0.66  1.16  1.22     3.9  35.0  15.0  410.0 1139.0 2100.0
                                                                                           159   574   572   458   519   447   487                              0.0  43.0  18.4  503.5 1398.0 2578.9
   0    0.0      80.5            768   632   633   593   612   676   675   662   665         81   112   105    40    43     0     0                              3.0  36.8  15.8  431.6 1198.9 2210.5
     NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG  .OUT REG =  20 DEG   P WB(in) = 5.00in H20   P WB(out) = 6.00in H20   DP(in) = 0.03in H20   DP(out) =-0.20in H20   FURN P = 0.01in H20   COAL P =10.40in H20
     MILL=  165 F   EXIT= 1596 F   EXIT(sp)= 1030 F   SMPL= 1366 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT 0   1   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE 106   UNSTAGED-GRAB SAMPLE

 253  11:13:37  101.1 17525 2483  1121  1154  1390  1217  3419  3335  3445  3026 20590    2483  6470  6754  1121  1154  1390  1217    0.14  0.51  0.90  1.17     3.2  30.0  15.6  290.0  853.5 2000.0
                                                                                           165   568   566   531   590   553   596                              0.0  35.4  18.4  342.1 1006.9 2359.6
   0    0.0      78.2            788   668   673   663   668   685   683   668   673         80    83    83   100   109   127   116                              3.0  30.3  15.8  293.3  863.1 2022.5
     NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 5.00in H20   P WB(out) = 6.00in H20   DP(in) = 0.30in H20   DP(out) =-0.20in H20   FURN P = 0.01in H20   COAL P =10.40in H20
     MILL=  171 F   EXIT= 1595 F   EXIT(sp)=  673 F   SMPL= 1371 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT 0   2   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 107   INTERMEDIATE STAGING

 340  11:57:31   99.3 17213 2436  2058  2270  1962  2275  2442  2591  2429  2450 20913    2436  4879  5033  2058  2270  1962  2275    0.14  0.42  0.72  1.21     3.8  30.0  15.0  230.0  294.5 2000.0
                                                                                           155   579   574   568   640   587   649                              0.0  36.6  18.3  280.8  359.6 2441.9
   0    0.0      78.2            811   722   724   715   717   723   721   696   706         77    63    62   191   226   185   227                              3.0  31.4  15.7  240.7  308.2 2093.0
     NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H20   P WB(out) = 1.90in H20   DP(in) = 0.15in H20   DP(out) = 0.10in H20   FURN P = 0.01in H20   COAL P =10.00in H20
     MILL=  157 F   EXIT= 1505 F   EXIT(sp)= 1777 F   SMPL= 1317 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT 0   3   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 108   FINAL STAGED-GRAB SAMPLE

 361  12:11:32  100.5 17421 2429  1998  1910  1922  2007  2492  2320  2466  2477 20029    2429  4943  4820  1998  1910  1922  2007    0.14  0:42  0.70  1.15     2.8  33.0  15.8  210.0  419.5 2100.0
                                                                                           156   572   581   579   654   597   652                              0.0  38.1  18.2  242.3  484.0 2423.1
   0    0.0      78.2            812   731   734   725   726   734   730   707   710         77    64    60   187   192   183   201                              3.0  32.6  15.6  207.7  414.9 2076.1
     NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H20   P WB(out) = 1.90in H20   DP(in) = 0.15in H20   DP(out) = 0.10in H20   FURN P = 0.01in H20   COAL P =10.00in H20
     MILL=  160 F   EXIT= 2153 F   EXIT(sp)= 1784 F   SMPL= 1334 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT 0   4   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE 109   MINIMUM EXCESS AIR

 380  12:21:37  105.6 18293 2523  2171  2351  2811  2327  2576  2590  2727  2667 22743    2523  5394  5166  2171  2351  2811  2327    0.14  0.43  0.72  1.24     4.2  25.0  14.6  230.0  587.5 1900.0
                                                                                           164   443   445   456   488   484   496                              0.0  31.3  18.3  287.5  734.4 2375.0
   0    0.0      78.2            716   525   523   521   524   523   521   511   520         81    61    56   179   201   239   200                              3.0  26.8  15.6  246.4  629.5 2035.1
     NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H20   P WB(out) = 1.90in H20   DP(in) = 0.15in H20   DP(out) = 0.10in H20   FURN P = 0.01in H20   COAL P =10.00in H20
     MILL=  170 F   EXIT= 1499 F   EXIT(sp)= 1723 F   SMPL= 1322 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT 0   5   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE 110   EXCESS AIR (25%)

 414  12:36:35  102.2 17712 2489  2467  2637  2684  2666  2454  2524  2377  2519 22818    2489  4896  4970  2467  2637  2684  2666    0.14  0.42  0.70  1.29     4.8  25.0  14.2  250.0  869.0 1850.0
                                                                                           165   511   512   523   591   550   596                              0.0  32.4  18.4  324.1 1126.5 2390.1
   0    0.0      78.2            772   659   661   654   656   658   657   634   643         80    59    58   219   250   244   254                              3.0  27.8  15.8  277.8  965.6 2055.0
     NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.60in H20   P WB(out) = 1.90in H20   DP(in) = 0.15in H20   DP(out) =-0.15in H20   FURN P = 0.02in H20   COAL P =10.00in H20
     MILL=  170 F   EXIT= 1666 F   EXIT(sp)= 1812 F   SMPL= 1334 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT 0   6   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE 111   HIGH EXCESS AIR

 494  13:22:12  103.3 17900 2464  2325  2279  2359  2260  2526  2613  2548  2490 21872    2464  5046  5140  2325  2279  2359  2260    0.14  0.42  0.71  1.22     3.9  25.0  14.6  240.0    0.0 1950.0
                                                                                           170   507   511   486   575   494   584                              0.0  30.7  17.9  294.7    0.0 2394.7
   0    0.0      78.2            775   655   658   650   653   658   658   635   642         80    61    60   198   213   203   213                              3.0  26.3  15.4  252.6    0.0 2052.6
     NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.60in H20   P WB(out) = 1.90in H20   DP(in) = 0.15in H20   DP(out) =-0.15in H20   FURN P = 0.02in H20   COAL P =10.00in H20
     MILL=  177 F   EXIT= 1581 F   EXIT(sp)= 1800 F   SMPL= 1351 F        SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT 0   7   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE 112   BASELINE
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DATE          :    07-20-83                          TER DIA        :     8
SYSTEM        :    LWS                               SPREADER       :     4"-4@20
BURNER        :    RSC  DMB                          R.H./B.P.      :     56/29.6
FUEL          :    INDIANA4                          OIL CHECK      :     94.98
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              LOAD         PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2    CO    CO2    NO     SO2   DUPONT
PT#    TIME  MBTU/HR  TA                     FLOW SCFM                                                 FLOW SCFM                               SR (CUM)                            MEASURED
  OIL         CALC  SCFM                                                             TEMP (F)              CORR TO 0% O2                                                         CORR TO 3% O2
(%)   LOAD    MEAS                           TEMP (F)                                              VELOCITY (FT/SEC)
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523  13:39:21  104.2 18053 2462  2342  2307  2129  2271  2578  2625  2577  2510 21809    2462  5095  5203  2342  2307  2129  2271    0.14  0.42  0.71  1.21     3.7  22.0  15.0  245.0     0.0 1500.0
                                                                                          176   491   490   483   533   471   545                                 0.0  26.7  18.2  297.4     0.0 1820.0
                                                                                           81    60    59   199   206   179   206                                 3.0  22.9  15.6  254.9     0.0 1560.7
  0    0.0    70.2          769   589   579   584   588   591   589   571   582
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.00in H2O    P WB(out) = 1.90in H2O   DP(in) = 0.20in H2O   DP(out) =-0.10in H2O   FURN P = 0.01in H2O    COAL P =10.00in H2O
    MILL=  104 F   EXIT= 1560 F   EXIT(sp)= 1780 F   SMPL= 1366 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 3.00    SORBENT AIR FLOW=  184  SCFM   [Ca]/[S]=  6.96
    VALID DATA POINT #   8   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 113   LIMESTONE INJECTION

564  14:01:02  104.0 18020 2486  2363  2300  2140  2319  2590  2695  2586  2549 22020    2486  5135  5285  2363  2300  2140  2319    0.14  0.42  0.72  1.22     3.9  25.0  14.6  250.0     0.0 1950.0
                                                                                          170   470   473   443   532   433   532                                 0.0  30.7  17.9  307.0     0.0 2394.7
                                                                                           81    60    59   192   206   172   207                                 3.0  26.3  15.4  263.2     0.0 2052.6
  0    0.0    70.2          743   609   608   597   603   610   606   587   591
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.00in H2O    P WB(out) = 1.90in H2O   DP(in) = 0.20in H2O   DP(out) =-0.10in H2O   FURN P = 0.01in H2O    COAL P =10.00in H2O
    MILL=  170 F   EXIT= 1761 F   EXIT(sp)= 1043 F   SMPL= 1361 F   SORBENT= VICRON          SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #   9   ELAPSED TIME, MIN   8   RECORD ON TRK   0   FILE 114   BASELINE

594  14:12:52  103.0 17849 2468  2206  2279  2120  2155  2532  2644  2520  2510 21442    2468  5030  5176  2206  2279  2120  2155    0.14  0.42  0.71  1.20     3.6  23.0  15.2  250.0 1087.5 1400.0
                                                                                          160   517   517   497   581   478   582                                 0.0  27.8  18.3  301.7 1312.5 1689.7
                                                                                           80    61    60   190   214   179   202                                 3.0  23.0  15.7  258.6 1125.0 1440.3
  0    0.0    70.2          775   773   663   763   775   679   663   639   646
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.00in H2O    P WB(out) = 1.90in H2O   DP(in) = 0.20in H2O   DP(out) =-0.10in H2O   FURN P = 0.01in H2O    COAL P =10.00in H2O
    MILL=  172 F   EXIT= 1606 F   EXIT(sp)= 1051 F   SMPL= 1375 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 6.10    SORBENT AIR FLOW=  152  SCFM   [Ca]/[S]=  1.38
    VALID DATA POINT #  10   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE 115   LIMESTONE INJ.-BAG COUNT 1.38(CA/S RATIO)

652  14:49:58  105.1 18219 2440  2304  2282  2196  2241  2437  2572  2500  2425 21406    2440  4933  5009  2304  2282  2196  2241    0.13  0.40  0.60  1.17     3.2  25.0  15.2  255.0  618.0 2000.0
                                                                                          175   540   546   482   606   477   608                                 0.0  29.5  17.9  300.0  729.1 2359.6
                                                                                           80    62    60   196   219   185   216                                 3.0  25.3  15.4  257.9  624.9 2022.5
  0    0.0    70.2          765   706   700   698   703   710   700   682   692
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.00in H2O    P WB(out) = 1.90in H2O   DP(in) = 0.20in H2O   DP(out) =-0.10in H2O   FURN P = 0.01in H2O    COAL P =10.00in H2O
    MILL=  103 F   EXIT= 1586 F   EXIT(sp)= 1009 F   SMPL= 1384 F                      SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #  11   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE 116   BASELINE

713  15:10:38  103.2 17887 2514  2270  2224  2180  2242  2490  2545  2472  2431 21360    2514  4902  5035  2270  2224  2180  2242    0.14  0.41  0.70  1.19     3.5  20.0  15.4  260.0  610.5 1300.0
                                                                                          177   557   562   534   626   532   633                                 0.0  24.0  18.5  312.0  742.2 1560.0
                                                                                           82    62    61   203   218   195   221                                 3.0  20.6  15.8  267.4  636.2 1337.1
  0    0.0    70.2          732   714   715   706   712   717   715   691   701
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.00in H2O    P WB(out) = 1.90in H2O   DP(in) = 0.20in H2O   DP(out) =-0.10in H2O   FURN P = 0.01in H2O    COAL P =10.00in H2O
    MILL=  104 F   EXIT= 1600 F   EXIT(sp)= 1049 F   SMPL= 1388 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 6.10    SORBENT AIR FLOW=  263  SCFM   [Ca]/[S]=  1.92
    VALID DATA POINT #  12   ELAPSED TIME, MIN   8   RECORD ON TRK   0   FILE 117   LIMESTONE INJECTION-REPEAT

726  15:30:11  104.1 18044 2533  2270  2226  2166  2230  2495  2564  2472  2419 21375    2533  4891  5059  2270  2226  2166  2230    0.14  0.41  0.69  1.18     3.4  22.0  15.4  260.0  640.5 1950.0
                                                                                          179   562   567   527   631   520   636                                 0.0  26.2  18.3  309.3  762.1 2320.1
                                                                                           83    62    62   202   219   193   220                                 3.0  22.4  15.7  265.2  653.2 1980.7
  0    0.0    70.2          661   721   721   710   714   722   719   694   704
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.00in H2O    P WB(out) = 1.90in H2O   DP(in) = 0.20in H2O   DP(out) =-0.10in H2O   FURN P = 0.01in H2O    COAL P =10.00in H2O
    MILL=  105 F   EXIT= 1634 F   EXIT(sp)= 1093 F   SMPL= 1402 F                      SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #  13   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE 118   BASELINE

810  16:13:32  103.2 17880 2611  2361  2317  2250  2317  2607  2738  2644  2522 22369    2611  5167  5345  2361  2317  2250  2317    0.15  0.43  0.73  1.25     4.3  20.0  14.2  270.0 1371.0 1850.0
                                                                                          166   437   439   426   502   428   503                                 0.0  25.1  17.9  339.5 1724.0 2326.3
                                                                                           84    58    57   189   201   180   201                                 3.0  21.6  15.3  291.0 1477.7 1994.0
  0    0.0    75.9          699   572   571   559   565   571   569   549   553
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.00in H2O    P WB(out) = 1.90in H2O   DP(in) = 0.20in H2O   DP(out) =-0.10in H2O   FURN P = 0.01in H2O    COAL P =10.00in H2O
    MILL=  172 F   EXIT= 1604 F   EXIT(sp)=  704 F   SMPL= 1377 F                      SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #  14   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 119   BASELINE
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DATE      :  07-20-83                TER DIA        :  8
SYSTEM    :  LWS                     SPREADER       :  4"-4020
BURNER    :  RSC  DMB                R.H./B.P.      :  56/29.6
FUEL      :  INDIANA4                OIL  CHECK     :  94.98
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               LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4   PRIM  SEC1  SEC2  TOTAL   O2    CO    CO2   NO    SO2  DUPONT
PT#   TIME    MBTU/HR  TA                            FLOW SCFM                                               FLOW SCFM                         SR (CUM)                                MEASURED
 OIL          CALC  SCFM                                                                  TEMP (F)                    CORR TO 0% O2
(%)   LOAD    MEAS                                    TEMP (F)                                         VELOCITY (FT/SEC)                                                             CORR TO 3% O2
-----------------------------------------------------------------------------------------------------------------------------------------------------

839  16:26:34  101.9  17657 2541  2321  2259  2213  2265  2542  2654  2549  2481  21825   2541  5031  5196  2321  2259  2213  2265   0.14  0.43  0.72  1.24    4.1  15.0  14.6  270.0  668.0  850.0
                                                                                           172   501   506   476   568   470   574                            0.0  18.6  18.1  335.5  830.1 1056.2
 1     0.0     75.9         755   653   652   641   646   654   651   629   635              83    60    60   196   209   185   211                            3.0  16.0  15.6  287.6  711.5  905.3
   NOZZLE =   0 in    SPREADER =   0 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.80in H2O    P WB(out) = 1.90in H2O    DP(in) = 0.20in H2O    DP(out) =-0.10in H2O    FURN P = 0.01in H2O    COAL P =10.00in H2O
   MILL=  102 F   EXIT= 1620 F   EXIT(sp)=  730 F   SMPL= 1400 F   SORBENT= Ca(OH)2    TERT INJECTION    SORBENT SPEED= 0.30    SORBENT AIR FLOW=  365  SCFM   [Ca]/[S]=  1.97
   VALID DATA POINT #  15   ELAPSED TIME, MIN  10   RECORD ON TRK  0   FILE 120   LIME INJECTION
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DATE                    :    07-21-83                                  TER DIA            :    8
SYSTEM                  :    LWS                                       SPREADER           :    4"-4020
BURNER                  :    RS                                        R.H./B.P.          :    56/29.6
FUEL                    :    INDIANA4                                  OIL CHECK          :    95.83

                LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2    CO    CO2    NO    SO2   DUPONT
PT#    TIME   MBTU/HR  TA                               FLOW SCFM                                             FLOW SCFM                           SR (CUM)                                 MEASURED
  OIL           CALC  SCFM                                                                   TEMP (F)                CORR TO 0% O2
(%)    LOAD     MEAS                                     TEMP (F)                                        VELOCITY (FT/SEC)                                                        CORR TO 3% O2

100  09:47:37    98.0 16984 2497   613   729     0     0  3932  4458  4203  4085 20518     2497  8288  8390   613   729     0     0    0.15  0.64  1.13  1.21     3.7  25.0  15.0  390.0 1376.5  159.0
                                                                                           157   555   552   485   516   451   539                             0.0  30.3  18.2  473.4 1670.9  193.0
 0     0.0     101.2           741   618   629   591   624   648   647   635   639          79   105   101    52    64     0     0                             3.0  26.0  15.6  405.8 1432.2  165.4
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 0.00in H2O   P WB(out) = 0.00in H2O   DP(in) = 0.00in H2O   DP(out) = 0.00in H2O   FURN P = 0.00in H2O   COAL P = 0.00in H2O
   MILL=  161 F   EXIT= 1620 F   EXIT(sp)= 1652 F   SMPL= 1385 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   1   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE 121   UNSTAGED

277  10:32:10   102.4 17737 2569  2200  2156  2175  2181  2867  2099  2541  2401 21188     2569  4942  4966  2200  2156  2175  2181    0.14  0.42  0.70  1.19     3.5  22.0  15.2  225.0  728.0 1900.0
                                                                                           177   522   532   551   607   559   596                             0.0  26.4  18.2  270.0  873.6 2280.0
 0     0.0      96.6           715   661   661   653   654   663   656   638   645          84    61    59   200   207   200   208                             3.0  22.6  15.6  231.4  748.8 1954.3
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 1.80in H2O   DP(in) = 0.10in H2O   DP(out) =-0.01in H2O   FURN P = 0.02in H2O   COAL P = 9.60in H2O
   MILL=  105 F   EXIT= 1637 F   EXIT(sp)= 1846 F   SMPL= 1369 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   2   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE 122   UNSTAGED-BASELINE

352  11:15:42   100.6 17433 2628  2187  2155  2147  2162  2843  2051  2509  2378 21060     2628  4888  4894  2187  2155  2147  2162    0.15  0.43  0.71  1.21     3.7  22.0  15.0  240.0 1232.0 1250.0
                                                                                           169   533   541   515   612   518   602                             0.0  26.7  18.2  291.3 1495.5 1517.3
 0     0.0      98.9           740   676   675   668   668   676   669   650   658          85    61    59   192   208   189   207                             3.0  22.9  15.6  249.7 1281.8 1300.6
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 1.80in H2O   DP(in) = 0.10in H2O   DP(out) =-0.01in H2O   FURN P = 0.02in H2O   COAL P = 9.60in H2O
   MILL=  174 F   EXIT= 1637 F   EXIT(sp)= 1870 F   SMPL= 1376 F   SORBENT= Ca(OH)2   TERT INJECTION   SORBENT SPEED= 4.60   SORBENT AIR FLOW=  273  SCFM   [Ca]/[S]=  1.00
   VALID DATA POINT #   3   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 123   LIME INJECTION-TERTS

395  11:26:27   102.8 17815 2612  2174  2145  2143  2155  2849  2050  2521  2396 21047     2612  4918  4899  2174  2145  2143  2155    0.15  0.42  0.70  1.18     3.3  21.0  15.4  235.0  516.5 1600.0
                                                                                           170   532   541   508   611   524   604                             0.0  24.9  18.3  278.8  612.8 1898.3
 0     0.0      98.9           751   679   677   671   671   680   672   653   660          85    61    59   190   207   190   207                             3.0  21.4  15.7  239.0  525.3 1627.1
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 1.80in H2O   DP(in) = 0.10in H2O   DP(out) =-0.01in H2O   FURN P = 0.02in H2O   COAL P = 9.60in H2O
   MILL=  176 F   EXIT= 1615 F   EXIT(sp)= 1838 F   SMPL= 1362 F   SORBENT= Ca(OH)2   TERT INJECTION   SORBENT SPEED= 2.70   SORBENT AIR FLOW=  260  SCFM   [Ca]/[S]=  0.47
   VALID DATA POINT #   4   ELAPSED TIME, MIN  15   RECORD ON TRK   0   FILE 124   LIME INJECTION-TERTS

450  12:06:29   100.7 17453 2623  2170  2116  2127  2154  2843  2045  2512  2377 20966     2623  4889  4887  2170  2116  2127  2154    0.15  0.43  0.71  1.20     3.6  22.0  14.8  245.0    0.0 1800.0
                                                                                           175   535   546   526   615   529   612                             0.0  26.6  17.9  295.7    0.0 2172.4
 0     0.0      96.6           705   687   687   680   680   687   681   662   670          86    61    59   193   205   190   208                             3.0  22.8  15.3  253.4    0.0 1862.1
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 1.80in H2O   DP(in) = 0.10in H2O   DP(out) =-0.01in H2O   FURN P = 0.02in H2O   COAL P = 9.60in H2O
   MILL=  181 F   EXIT= 1663 F   EXIT(sp)= 1082 F   SMPL= 1379 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   5   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 125   BASELINE

485  12:28:25   101.9 17650 2609  2161  2146  2142  2157  2850  2041  2491  2370 20967     2609  4861  4891  2161  2146  2142  2157    0.15  0.42  0.70  1.19     3.4  20.0  15.2  240.0 1071.0 1600.0
                                                                                           174   526   542   524   607   527   613                             0.0  23.9  18.1  286.4 1277.9 1909.1
 0     0.0      96.6           685   690   691   683   685   692   686   666   674          85    60    59   192   206   191   209                             3.0  20.5  15.5  245.5 1095.3 1636.1
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 1.80in H2O   DP(in) = 0.10in H2O   DP(out) =-0.01in H2O   FURN P = 0.02in H2O   COAL P = 9.60in H2O
   MILL=  179 F   EXIT= 1644 F   EXIT(sp)= 1008 F   SMPL= 1379 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 2.60   SORBENT AIR FLOW=  191  SCFM   [Ca]/[S]=  0.48
   VALID DATA POINT #   6   ELAPSED TIME, MIN  15   RECORD ON TRK   0   FILE 126   LIMESTONE INJECTION-TERTS

506  12:44:42   101.4 17577 2624  2162  2116  2115  2152  2846  2020  2476  2371 20880     2624  4847  4865  2162  2116  2115  2152    0.15  0.43  0.70  1.19     3.4  22.0  15.2  240.0 1362.0 1900.0
                                                                                           174   538   553   541   621   545   624                             0.0  26.3  18.1  286.4 1625.1 2267.0
 0     0.0      96.6           691   696   694   687   689   696   690   671   678          86    60    59   195   206   192   210                             3.0  22.5  15.5  245.5 1393.0 1943.2
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 1.80in H2O   DP(in) = 0.10in H2O   DP(out) =-0.01in H2O   FURN P = 0.02in H2O   COAL P = 9.60in H2O
   MILL=  179 F   EXIT= 1665 F   EXIT(sp)= 1867 F   SMPL= 1383 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   7   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE 127   BASELINE
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DATE          :  07-21-83                                    TER DIA      :  8
SYSTEM        :  LWS                                         SPREADER     :  4"-4020
BURNER        :  RS                                          R.H./B.P.    :  56/29.6
FUEL          :  INDIANA4                                    OIL CHECK    :  95.83
-------------------------------------------------------------------------------------------------------------------------------------------------------
              LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2    CO    CO2    NO     SO2  DUPONT
PT#   TIME   MBTU/HR  TA                          FLOW SCFM                                            FLOW SCFM                          SR (CUM)                           MEASURED
 OIL          CALC  SCFM                                                                   TEMP (F)           CORR TO 0% O2
(%)   LOAD    MEAS                                TEMP (F)                                          VELOCITY (FT/SEC)                                                  CORR TO 3% O2
-------------------------------------------------------------------------------------------------------------------------------------------------------

534  12:57:17  100.6  17423  2481  2175  2163  2151  2165  2858  2052  2510  2376  20931   2481  4885  4910  2175  2163  2151  2165    0.14  0.42  0.70  1.20    3.6  20.0  15.0  230.0    0.0 1550.0
                                                                                            170   521   534   531   604   563   614                               0.0  24.1  18.1  277.6    0.0 1870.7
                                                                                             81    60    58   194   207   198   210                               3.0  20.7  15.5  237.9    0.0 1603.4
 0    0.0    96.6        739   691   691   684   688   694   688   664   674   P WB(in) = 1.70in H20   P WB(out) = 1.80in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.02in H20   COAL P = 9.60in H20
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H20
   MILL=  178 F   EXIT= 1637 F   EXIT(sp)= 1870 F   SMPL= 1381 F   SORBENT= VICRON   MILL INJECTION   SORBENT SPEED= 2.60   SORBENT AIR FLOW=  231  SCFM   [Ca]/[S]=  0.49
   VALID DATA POINT #   8   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE 129   LIMESTONE INJECTION-MILL

577  13:19:00  100.9  17404  2496  2159  2134  2145  2168  2858  2051  2493  2382  20886   2496  4075  4909  2159  2134  2145  2168    0.14  0.42  0.70  1.19    3.5  20.0  15.2  230.0  380.0 1450.0
                                                                                            172   524   537   547   613   574   622                               0.0  24.0  18.2  276.0  456.0 1740.0
                                                                                             81    60    59   196   206   200   211                               3.0  20.6  15.6  236.6  390.9 1491.4
 0    0.0    96.6        737   689   689   681   685   693   686   663   674   P WB(in) = 1.70in H20   P WB(out) = 1.80in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.02in H20   COAL P = 9.60in H20
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H20
   MILL=  180 F   EXIT= 1612 F   EXIT(sp)= 1825 F   SMPL= 1391 F   SORBENT= VICRON   MILL INJECTION   SORBENT SPEED= 3.00   SORBENT AIR FLOW=  196  SCFM   [Ca]/[S]=  0.99
   VALID DATA POINT #   9   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE 130   LIMESTONE INJECTION-MILL

646  13:58:16  101.7  17617  2456  2157  2143  2141  2152  2872  2030  2513  2349  20813   2456  4862  4902  2157  2143  2141  2152    0.14  0.42  0.69  1.18    3.3  20.0  15.8  230.0    0.0 1150.0
                                                                                            176   521   536   537   606   565   610                               0.0  23.7  18.7  272.9    0.0 1364.4
                                                                                             80    59    58   194   206   198   209                               3.0  20.3  16.1  233.9    0.0 1169.5
 0    0.0    96.6        710   690   690   681   687   695   689   667   676   P WB(in) = 1.70in H20   P WB(out) = 1.80in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.02in H20   COAL P = 9.60in H20
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H20
   MILL=  184 F   EXIT= 1653 F   EXIT(sp)= 1745 F   SMPL= 1445 F   SORBENT= VICRON   MILL INJECTION   SORBENT SPEED= 6.10   SORBENT AIR FLOW=  200  SCFM   [Ca]/[S]=  1.95
   VALID DATA POINT #  10   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 131   LIMESTONE INJECTION-MILL

659  14:07:05  101.9  17651  2440  2154  2137  2129  2131  2868  2021  2484  2366  20738   2440  4850  4889  2154  2137  2129  2131    0.14  0.41  0.69  1.17    3.2  20.0  15.4  240.0  542.5 1800.0
                                                                                            176   520   539   546   618   572   624                               0.0  23.6  18.2  283.1  640.0 2123.6
                                                                                             80    60    58   195   208   198   208                               3.0  20.2  15.6  242.7  548.6 1820.2
 0    0.0    96.6        672   691   693   684   689   696   691   668   678   P WB(in) = 1.70in H20   P WB(out) = 1.80in H20   DP(in) = 0.10in H20   DP(out) =-0.01in H20   FURN P = 0.02in H20   COAL P = 9.60in H20
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H20
   MILL=  183 F   EXIT= 1606 F   EXIT(sp)= 1701 F   SMPL= 1410 F   SORBENT= VICRON      SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  11   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE 132   BASELINE
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DATE          :   07-22-83                           TER DIA      :   8
SYSTEM        :   LWS                                SPREADER     :   4"-4020
BURNER        :   RSC DMB                            R.H./D.P.    :   65/29.6
FUEL          :   ILLINOIS2                          OIL CHECK    :   94.97
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------
               LOAD           PRIM  V-2  V-3  V-4  V-5  V-6  V-7  V-8  V-9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2   CO   CO2   NO   SO2  DUPONT
PT0    TIME  MBTU/HR  TA                     FLOW SCFM                                          FLOW SCFM                         SR (CUM)                              MEASURED
 OIL           CALC  SCFM                                                           TEMP (F)            CORR TO 0% O2
                                             TEMP (F)                                            VELOCITY (FT/SEC)                                                CORR TO 3% O2
(%)   LOAD     MEAS
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

341  11:02:16    97.4 16274 2562   604  759     0     0 4100  3517  3757  4130 19437    2562  7895  7617   604   759     0     0    0.16  0.64  1.11  1.19     3.5  20.0  14.0  340.0   0.0   0.0
                                                                                      167   555   570   402   500   474   519                              0.0  24.0  17.8  400.0   0.0   0.0
                                                                                       83   100    94    51    66     0     0                              3.0  20.6  15.2  349.7   0.0   0.0
  0    0.0   110.3           775   640  657   610   634   691   679   665   671
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 0.00in H2O   P WB(out) = 0.00in H2O   DP(in) = 0.00in H2O   DP(out) = 0.00in H2O   FURN P = 0.00in H2O   COAL P = 0.00in H2O
   MILL=  172 F   EXIT= 1642 F   EXIT(sp)= 1603 F   SMPL= 1399 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT 0   1   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE 133   UNSTAGED

400  11:30:24   100.3 16750 2574  1405 1444  1343  1370  3353  2935  2904  3020 20356    2574  5925  6200  1405  1444  1343  1370    0.15  0.51  0.80  1.21     3.0  22.0  14.6  260.0 547.5   0.0
                                                                                      168   540   550   530   594   546   594                              0.0  26.9  17.0  317.4 668.5   0.0
                                                                                       83    75    76   125   137   122   131                              3.0  23.0  15.3  272.1 573.0   0.1
  0    0.0   116.0           775   670  674   662   667   684   680   662   669
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 0.00in H2O   P WB(out) = 0.00in H2O   DP(in) = 0.00in H2O   DP(out) = 0.00in H2O   FURN P = 0.00in H2O   COAL P = 0.00in H2O
   MILL=  174 F   EXIT= 1580 F   EXIT(sp)= 1651 F   SMPL= 1301 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT 0   2   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE 134   INTERMEDIATE STAGING

446  11:56:55   104.0 17304 2507  1726 1796  1039  1656  3034  2732  2037  2909 21116    2507  5026  5765  1726  1796  1039  1656    0.14  0.40  0.81  1.21     3.0  21.0  14.2  250.0 726.0   0.0
                                                                                      172   562   567   549   620   569   611                              0.0  25.6  17.3  305.2 886.4   0.0
                                                                                       82    74    71   157   175   170   160                              3.0  22.0  14.9  261.6 759.0   0.1
  0    0.0   116.0           786   608  692   681   603   696   693   672   680
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 0.00in H2O   P WB(out) = 0.00in H2O   DP(in) = 0.00in H2O   DP(out) = 0.00in H2O   FURN P = 0.00in H2O   COAL P = 0.00in H2O
   MILL=  170 F   EXIT= 1600 F   EXIT(sp)= 1666 F   SMPL= 1391 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT 0   3   ELAPSED TIME, MIN   8   RECORD ON TRK   0   FILE 135   INTERMEDIATE STAGING

489  12:19:39   102.7 17163 2555  2213 2143  2269  2279  2464  2347  2381  2317 20968    2555  4690  4811  2213  2143  2269  2279    0.15  0.42  0.70  1.22     3.9  20.0  14.4  215.0   0.0   0.0
                                                                                      170   553   555   582   636   591   630                              0.0  24.6  17.7  264.0   0.0   0.0
                                                                                       83    59    58   200   212   215   224                              3.0  21.1  15.2  226.3   0.0   0.1
  0    0.0   116.0           784   697  697   689   690   697   694   671   680
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.60in H2O   P WB(out) = 2.30in H2O   DP(in) = 0.20in H2O   DP(out) =-0.15in H2O   FURN P = 0.01in H2O   COAL P =10.10in H2O
   MILL=  174 F   EXIT= 1561 F   EXIT(sp)= 1632 F   SMPL= 1349 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT 0   4   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE   1   FINAL STAGING

544  12:48:47   102.6 17150 2538  2042 1970  1936  2025  2293  2413  2326  2385 19928    2538  4711  4706  2042  1970  1936  2025    0.15  0.42  0.70  1.16     3.0  21.0  15.4  205.0   0.0   0.0
                                                                                      167   559   562   571   643   584   634                              0.0  24.5  18.0  239.2   0.0   0.0
                                                                                       82    60    57   190   196   182   200                              3.0  21.0  15.4  205.0   0.0   0.1
  0    0.0   116.0           780   713  715   705   706   711   709   684   695
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.60in H2O   P WB(out) = 2.30in H2O   DP(in) = 0.20in H2O   DP(out) =-0.15in H2O   FURN P = 0.01in H2O   COAL P =10.10in H2O
   MILL=  173 F   EXIT= 1573 F   EXIT(sp)= 1666 F   SMPL= 1359 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT 0   5   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE   2   LOW EXCESS AIR

569  13:02:51   102.2 17078 2566  2281 2312  2227  2343  2409  2409  2211  2470 21227    2566  4600  4010  2281  2312  2227  2343    0.15  0.42  0.71  1.24     4.2  18.0  14.4  220.0   0.0   0.0
                                                                                      166   562   564   585   647   597   644                              0.0  22.5  18.0  275.0   0.0   0.0
                                                                                       83    60    59   215   231   212   233                              3.0  19.3  15.4  235.7   0.0   0.1
  0    0.0   116.0           794   717  719   710   711   716   713   687   700
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.60in H2O   P WB(out) = 2.30in H2O   DP(in) = 0.20in H2O   DP(out) =-0.15in H2O   FURN P = 0.01in H2O   COAL P =10.10in H2O
   MILL=  171 F   EXIT= 1549 F   EXIT(sp)= 1651 F   SMPL= 1357 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT 0   6   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE   3   MID EXCESS AIR

591  13:16:13   102.5 17122 2571  2497 2492  2530  2512  2413  2476  2141  2609 22322    2571  4830  4889  2497  2492  2530  2512    0.15  0.43  0.72  1.30     5.0  18.0  13.8  225.0   0.0   0.0
                                                                                      166   548   555   568   637   587   633                              0.0  23.6  18.1  295.3   0.0   0.0
                                                                                       83    61    59   231   246   239   247                              3.0  20.3  15.5  253.1   0.0   0.0
  0    0.0   113.8           780   709  707   701   702   706   703   675   691
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.60in H2O   P WB(out) = 2.30in H2O   DP(in) = 0.20in H2O   DP(out) =-0.15in H2O   FURN P = 0.01in H2O   COAL P =10.10in H2O
   MILL=  172 F   EXIT= 1519 F   EXIT(sp)= 1620 F   SMPL= 1355 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT 0   7   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE   4   HIGH EXCESS AIR
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DATE          :   07-22-83                                        TER DIA      :   8
SYSTEM        :   LWS                                             SPREADER     :   4"-4@20
BURNER        :   RSC  DMB                                        R.H./B.P.    :   65/29.6
FUEL          :   ILLINOIS2                                       OIL  CHECK   :   94.97
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               LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2    CO   CO2   NO    SO2  DUPONT
PT#    TIME  MBTU/HR  TA                         FLOW SCFM                                                   FLOW SCFM                         SR (CUM)                              MEASURED
  OIL                                                                                      TEMP (F)              CORR TO 0% O2
               CALC  SCFM                                                                             VELOCITY (FT/SEC)                                                          CORR TO 3% O2
(%)    LOAD    MEAS                              TEMP (F)
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------

071  15:35:25  62.4 10425 2666  685   688   721   698  2029  1498  1599  1868  12451    2666  3467  3527   685   688   721   698    0.26  0.59  0.93  1.19     3.5  40.0  14.8  205.0  0.0  0.0
                                                                                          172   577   591   503   598   558   670                              0.0  48.0  17.8  246.0  0.0  0.0
 4    0.0      64.2               585   773   797   783   796   823   817   780   791     87    45    44    59    66    66    71                              3.0  41.1  15.2  210.9  0.0  0.0
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.60in H2O   P WB(out) = 2.30in H2O   DP(in) = 0.20in H2O   DP(out) =-0.15in H2O   FURN P = 0.01in H2O   COAL P =10.10in H2O
   MILL=  170 F   EXIT= 1294 F   EXIT(sp)= 1444 F   SMPL= 1113 F         SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   8   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE   5   LOW LOAD

911  15:54:46  67.0 11189 2600 1400  1396  1403  1474  1496  1229  1297  1220  13514    2600  2517  2726  1400  1396  1403  1474    0.23  0.46  0.70  1.21     3.7  35.0  14.8  180.0  0.0  0.0
                                                                                          178   586   589   598   703   633   727                              0.0  42.5  18.0  218.5  0.0  0.0
 0    0.0      64.2               708   833   847   832   836   843   839   793   813     85    33    34   133   146   138   158                              3.0  36.4  15.4  187.3  0.0  0.1
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 0.50in H2O   P WB(out) = 0.20in H2O   DP(in) = 0.10in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O  , COAL P = 0.00in H2O
   MILL=  189 F   EXIT= 1357 F   EXIT(sp)= 1467 F   SMPL= 1118 F         SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   9   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE   6   LOW LOAD-STAGED
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                                                                                     TER DIA       :   8
DATE       :   07-26-83                                                              SPREADER      :   4"-4@20
SYSTEM     :   LWS                                                                   R.H./B.P.     :   62/29.6
BURNER     :   RSC DMB                                                               OIL CHECK     :   94.63
FUEL       :   ILLINOIS2
                                                                                                                                                        O2    CO    CO2   NO    SO2   DUPONT
                             PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL                   MEASURED
            LOAD                                   FLOW SCFM                                                FLOW SCFM                            SR (CUM)
PT#   TIME  MBTU/HR  TA                                                                                          CORR TO 0% O2
  OIL              CALC  SCFM                                                                 TEMP (F)                                                                        CORR TO 3% O2
                                                   TEMP (F)                                              VELOCITY (FT/SEC)
(%)   LOAD          MEAS

214 11:25:44  103.5 17297 2569   687   803     0     0  4035  4276  4218  4070 20659    2569  8288  8312   687   803     0     0    0.15  0.63  1.11  1.19    3.5  23.0  15.0 350.0  919.5 3150.0
                                                                                       157   578   578   535   558   489   547                              0.0  27.6  18.0 420.0 1103.4 3780.0
                                                                                        82   107   103    62    74     0     0                              3.0  23.7  15.4 360.0  945.8 3240.0
  0   0.0   103.6         717   643   656   610   636   675   674   661   664    P WB(in) = 0.00in H20   P WB(out) = 0.00in H20   DP(in) = 0.00in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P = 0.00in H20
    NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG                SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0 SCFM   [Ca]/[S]=  0.00
    MILL=  158 F   EXIT= 1620 F   EXIT(sp)= 1790 F   SMPL= 1251 F
    VALID DATA POINT #   1   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE   7   UNSTAGED

303 12:07:58  100.3 16756 2658  2124  2094  2240  2074  2320  2109  2211  2313 20239    2658  4523  4517  2124  2094  2240  2074    0.16  0.43  0.70  1.21    3.7  21.0  14.8 205.0    0.0 3100.0
                                                                                       163   545   555   577   642   605   638                              0.0  25.5  18.0 248.8    0.0 3763.0
                                                                                        85    57    55   198   208   216   205                              3.0  21.8  15.4 213.3    0.0 3225.4
  0   0.0    96.9         750   707   710   699   704   707   704   679   689    P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 8.90in H20
    NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG                SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0 SCFM   [Ca]/[S]=  0.00
    MILL=  165 F   EXIT= 1597 F   EXIT(sp)= 1755 F   SMPL= 1180 F
    VALID DATA POINT #   2   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE   8   BASELINE

392 12:58:19   99.0 16542 2635  2124  2103  2127  2102  2377  2104  2156  2309 20037    2635  4465  4482  2124  2103  2127  2102    0.16  0.43  0.70  1.21    3.8  22.0  14.8 205.0    0.0 2500.0
                                                                                       163   505   516   514   595   530   605                              0.0  26.8  18.0 249.6    0.0 3043.5
                                                                                        84    54    52   186   200   190   202                              3.0  23.0  15.4 213.9    0.0 2600.7
  0   0.0    96.9         726   682   683   673   676   686   681   652   664    P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 8.90in H20
    NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 3.10   SORBENT AIR FLOW=  195 SCFM   [Ca]/[S]=  0.69
    MILL=  167 F   EXIT= 1625 F   EXIT(sp)= 1655 F   SMPL= 1227 F
    VALID DATA POINT #   3   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE   9   LIMESTONE INJECTION-TERTS

432 13:21:21   97.9 16351 2612  2101  2081  2110  2078  2351  2083  2136  2254 19805    2612  4389  4434  2101  2081  2110  2078    0.16  0.43  0.70  1.21    3.8  22.0  15.0 210.0    0.0 2250.0
                                                                                       164   536   542   527   621   534   629                              0.0  26.0  18.3 255.7    0.0 2739.1
                                                                                        84    55    53   187   203   189   204                              3.0  23.0  15.7 219.1    0.0 2347.0
  0   0.0    98.0         746   709   712   699   701   717   711   682   693    P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 8.90in H20
    NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 4.00   SORBENT AIR FLOW=  281 SCFM   [Ca]/[S]=  1.18
    MILL=  167 F   EXIT= 1623 F   EXIT(sp)= 1679 F   SMPL= 1240 F
    VALID DATA POINT #   4   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  10   LIMESTONE INJECTION-TERTS

460 13:32:05   97.0 16350 2645  2090  2084  2111  2074  2342  2066  2117  2210 19748    2645  4335  4400  2090  2084  2111  2074    0.16  0.43  0.70  1.21    3.7  21.0  15.2 202.0    0.0 2200.0
                                                                                       164   544   551   524   632   548   636                              0.0  25.5  18.5 245.2    0.0 2670.5
                                                                                        85    54    53   185   205   192   205                              3.0  21.8  15.8 210.2    0.0 2289.0
  0   0.0    98.0         751   717   718   707   709   721   717   688   700    P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 8.90in H20
    NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 6.50   SORBENT AIR FLOW=  274 SCFM   [Ca]/[S]=  1.65
    MILL=  172 F   EXIT= 1602 F   EXIT(sp)= 1684 F   SMPL= 1261 F
    VALID DATA POINT #   5   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  11   LIMESTONE INJECTION-TERTS

476 13:45:24   98.7 16486 2600  2097  2067  2100  2072  2332  2056  2126  2240 19691    2600  4366  4380  2097  2067  2100  2072    0.16  0.42  0.69  1.19    3.5  21.0  15.0 215.0    0.0 2950.0
                                                                                       165   551   559   530   643   537   640                              0.0  25.2  18.0 258.0    0.0 3540.0
                                                                                        84    55    53   187   205   189   205                              3.0  21.6  15.4 221.1    0.0 3034.3
  0   0.0    98.0         756   721   724   713   713   728   725   696   706    P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 8.90in H20
    NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG                SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0 SCFM   [Ca]/[S]=  0.00
    MILL=  170 F   EXIT= 1620 F   EXIT(sp)= 1692 F   SMPL= 1254 F
    VALID DATA POINT #   6   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  12   BASELINE

510 14:01:39  100.0 16703 2580  2104  2094  2115  2073  2349  2030  2113  2256 19730    2580  4369  4387  2104  2094  2115  2073    0.15  0.42  0.68  1.18    3.3  21.0  14.8 225.0    0.0 3000.0
                                                                                       166   545   555   513   640   536   641                              0.0  24.9  17.6 266.9    0.0 3559.3
                                                                                        83    55    53   184   207   190   206                              3.0  21.4  15.1 228.8    0.0 3050.0
  0   0.0    98.0         754   727   727   717   718   733   727   696   709    P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 8.90in H20
    NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG                SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0 SCFM   [Ca]/[S]=  0.00
    MILL=  170 F   EXIT= 1605 F   EXIT(sp)= 1677 F   SMPL= 1256 F
    VALID DATA POINT #   7   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  13   BASELINE
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DATE           :   07-26-83                                TER DIA          :   8
SYSTEM         :   LWS                                     SPREADER         :   4"-;4@20
BURNER         :   RSC  DMB                                R.H./B.P.        :   62/29.6
FUEL           :   ILLINOIS2                               OIL CHECK        :   94.63
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            LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2 TOTAL    O2    CO   CO2    NO    SO2 DUPONT
PT#   TIME  MBTU/HR  TA                       FLOW SCFM                                             FLOW SCFM                           SR (CUM)                             MEASURED
 OIL             CALC  SCFM                                                           TEMP (F)                CORR TO 0% O2
                                                                                                  VELOCITY (FT/SEC)                                                         CORR TO 3% O2
(%)   LOAD       MEAS                            TEMP (F)
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539  14:16:56   99.8 16667 2601  2097  2083  2103  2082  2340  2011  2121  2249 19687   2601  4370  4351  2097  2083  2103  2082    0.16  0.42  0.68  1.18    3.3  21.0  15.0 230.0   0.0 2300.0
                                                                                        165   548   555   517   641   543   640                            0.0  24.9  17.8 272.9   0.0 2728.8
  0   0.0   98.0          757   726   727   717   718   736   728   696   709            84    55    53   185   207   190   206                            3.0  21.4  15.3 233.9   0.0 2339.0
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 8.90in H20
   MILL=  169 F   EXIT= 1611 F   EXIT(sp)= 1691 F   SMPL= 1268 F   SORBENT= Ca(OH)2   TERT INJECTION   SORBENT SPEED= 3.60   SORBENT AIR FLOW=  354  SCFM   [Ca]/[S]=  0.51
   VALID DATA POINT #  8   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  14   LINE-TERTS

568  14:34:27  100.7 16826 2630  2094  2083  2106  2085  2350  2048  2124  2246 19766   2630  4370  4398  2094  2083  2106  2085    0.16  0.42  0.68  1.17    3.2  22.0  15.0 220.0   0.0 2000.0
                                                                                        165   549   553   532   645   543   643                            0.0  26.0  17.7 259.6   0.0 2359.6
  0   0.0   98.0          757   727   729   716   719   737   730   699   712            85    55    53   187   207   190   207                            3.0  22.2  15.2 222.5   0.0 2022.5
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 8.90in H20
   MILL=  168 F   EXIT= 1638 F   EXIT(sp)= 1704 F   SMPL= 1286 F   SORBENT= Ca(OH)2   TERT INJECTION   SORBENT SPEED= 6.20   SORBENT AIR FLOW=  319  SCFM   [Ca]/[S]=  0.99
   VALID DATA POINT #  9   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  15   LINE-TERTS

592  14:47:41  100.0 16846 2642  2106  2088  2125  2082  2337  2029  2124  2257 19789   2642  4381  4366  2106  2088  2125  2082    0.16  0.42  0.68  1.17    3.2  21.0  15.0 230.0   0.0 2000.0
                                                                                        162   545   550   526   635   539   640                            0.0  24.8  17.7 271.3   0.0 2359.6
  0   0.0   98.0          757   728   730   717   719   736   730   699   710            85    55    53   187   206   191   206                            3.0  21.2  15.2 232.6   0.0 2022.5
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 8.90in H20
   MILL=  167 F   EXIT= 1627 F   EXIT(sp)= 1713 F   SMPL= 1283 F   SORBENT= Ca(OH)2   TERT INJECTION   SORBENT SPEED= 6.80   SORBENT AIR FLOW=  303  SCFM   [Ca]/[S]=  1.10
   VALID DATA POINT #  10   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  16   LINE-TERTS

618  15:03:13  102.7 17159 2464  2106  2051  2090  2066  2580  2119  2304  2268 20047   2464  4571  4699  2106  2051  2090  2066    0.14  0.41  0.68  1.17    3.1  20.0  15.0 230.0   0.0 3000.0
                                                                                        162   546   553   560   637   597   645                            0.0  23.5  17.6 269.8   0.0 3519.6
  0   0.0   98.0          759   723   726   713   717   736   729   696   709            79    57    57   194   203   199   206                            3.0  20.1  15.1 231.3   0.0 3016.8
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 8.90in H20
   MILL=  167 F   EXIT= 1602 F   EXIT(sp)= 1701 F   SMPL= 1293 F              SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  11   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  17   BASELINE

636  15:12:06  100.0 16710 2540  2079  2043  2080  2037  2579  2139  2283  2291 20070   2540  4574  4710  2079  2043  2080  2037    0.15  0.43  0.71  1.20    3.6  20.0  14.8 230.0   0.0 2550.0
                                                                                        164   550   556   565   633   596   642                            0.0  24.1  17.9 277.6   0.0 3077.6
  0   0.0   98.0          760   724   724   710   713   734   727   696   709            82    58    57   192   201   198   202                            3.0  20.7  15.3 237.9   0.0 2637.0
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 8.90in H20
   MILL=  169 F   EXIT= 1582 F   EXIT(sp)= 1677 F   SMPL= 1298 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 3.10   SORBENT AIR FLOW=  172  SCFM   [Ca]/[S]=  0.69
   VALID DATA POINT #  12   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  18   LIMESTONE-MILL

653  15:24:52  100.0 16706 2487  2073  2052  2081  2049  2557  2173  2297  2297 20065   2487  4593  4730  2073  2052  2081  2049    0.15  0.42  0.71  1.20    3.6  21.0  15.0 230.0   0.0 2350.0
                                                                                        161   556   562   568   638   591   642                            0.0  25.3  18.1 277.6   0.0 2836.2
  0   0.0   98.0          757   724   725   710   714   735   727   701   710            80    58    58   192   203   197   203                            3.0  21.7  15.5 237.9   0.0 2431.0
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 8.90in H20
   MILL=  166 F   EXIT= 1603 F   EXIT(sp)= 1662 F   SMPL= 1318 F   SORBENT= VICRON   MILL INJECTION   SCRBENT SPEED= 4.80   SORBENT AIR FLOW=  208  SCFM   [Ca]/[S]=  1.15
   VALID DATA POINT #  13   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  19   LIMESTONE-MILL

701  15:50:31  101.5 16960 2588  2121  2088  2109  2078  2617  2263  2383  2354 20601   2588  4738  4880  2121  2088  2109  2078    0.15  0.43  0.72  1.21    3.8  20.0  14.6 230.0   0.0 2100.0
                                                                                        159   498   507   519   573   539   578                            0.0  24.4  17.8 280.8   0.0 2564.0
  0   0.0   98.0          789   649   650   635   640   654   649  .625   633            82    57    56   187   194   190   194                            3.0  20.9  15.3 240.7   0.0 2197.3
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 8.90in H20
   MILL=  164 F   EXIT= 1618 F   EXIT(sp)= 1683 F   SMPL= 1300 F   SORBENT= VICRON   MILL INJECTION   SORBENT SPEED= 6.50   SORBENT AIR FLOW=  256  SCFM   [Ca]/[S]=  1.59
   VALID DATA POINT #  14   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  20   LIMESTONE-MILL
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DATE          :    07-26-83                                TER DIA        :   8
SYSTEM        :    LWS                                     SPREADER       :   4"-4020
BURNER        :    RSC  DMB                                R.H./B.P.      :   62/29.6
FUEL          :    ILLINOIS2                               OIL  CHECK     :   94.63
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              LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4   PRIM  SEC1  SEC2  TOTAL   O2    CO    CO2   NO     SO2  DUPONT
PT#    TIME  MBTU/HR  TA                      FLOW SCFM                                               FLOW SCFM                         SR (CUM)                           MEASURED
  OIL     .   CALC  SCFM                                                               TEMP (F)               CORR TO 0% O2
(%)    LOAD   MEAS                            TEMP (F)                                             VELOCITY (FT/SEC)                                                  CORR TO 3% O2
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720  16:01:11   101.3 16920 2600  2116  2065  2120  2083  2575  2214  2331  2333 20446    2608  4665  4790  2116  2065  2120  2083   0.15  0.43  0.71  1.21    3.7  20.0  14.4  230.0   0.0 2900.0
                                                                                           159   526   533   529   605   552   606                            0.0  24.3  17.5  279.2   0.0 3520.2
                                                                                            83    57    57   108   198   193   200                            3.0  20.8  15.0  239.3   0.0 3017.3
 0    0.0     98.0           731   690   691   677   682   697   693   667   673
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 0.90in H20
   MILL=  166 F   EXIT= 1570 F   EXIT(sp)= 1669 F   SMPL= 1297 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  15   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  21   BASELINE

807  16:44:22    63.0 10521 2586  1232  1231  1230  1240  1154  1378  1362  1145 12566    2586  2508  2532  1232  1231  1230  1248   0.25  0.48  0.72  1.19    3.5  32.0  15.2  195.0   0.0 3075.0
                                                                                           160   474   462   468   532   504   560                            0.0  38.4  18.2  234.0   0.0 3690.0
                                                                                            82    29    28   103   110   107   115                            3.0  32.9  15.6  200.6   0.0 3162.1
 0    0.0     67.6           538   636   643   627   636   647   646   616   627
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 0.90in H20
   MILL=  150 F   EXIT= 1352 F   EXIT(sp)= 1454 F   SMPL= 1039 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  16   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  22   BASELINE

854  17:07:00    65.0 10062 2618  1233  1309  1350  1341  1529  1209  1512  1315 13423    2618  2827  2730  1233  1309  1350  1341   0.24  0.50  0.75  1.24    4.1  22.0  15.0  225.0   0.0 2050.0
                                                                                           150   442   444   427   515   423   520                            0.0  27.3  18.6  279.6   0.0 2547.3
                                                                                            82    32    30    99   115   108   119                            3.0  23.4  16.0  239.6   0.0 2183.1
 0    0.0     67.6           509   607   614   599   608   619   614   591   596
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.60in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.02in H20   COAL P = 0.90in H20
   MILL=  150 F   EXIT= 1373 F   EXIT(sp)= 1456 F   SMPL= 1102 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 4.50   SORBENT AIR FLOW=  340  SCFM   [Ca]/[S]=  1.55
   VALID DATA POINT #  17   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  23   LOW LOAD-TERTS
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DATE            :   07-27-83                          ~~TER-DIA~~     :   8
SYSTEM          :   LWS                               SPREADER        :   4"-4020
BURNER          :   RSC DMB                           R.H./B.P.       :   60/29.6
FUEL            :   UTAH6"                            OIL CHECK       :   94.83
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                 LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL     PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2    CO    CO2    NO     SO2  DUPONT
PT#    TIME    MBTU/HR  TA                          FLOW SCFM                                                    FLOW SCFM                         SR (CUM)                             MEASURED
  OIL            CALC  SCFM                                                                    TEMP (F)               CORR TO 0% O2
 (%)   LOAD      MEAS                               TEMP (F)                                              VELOCITY (FT/SEC)                                                              CORR TO 3% O2
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178  11:12:16   98.8 16820 2762   441   720     0     0  4140  3955  4270  4016 20312     2762  8287  8103   441   720     0     0    0.16  0.66  1.14  1.21     3.7  25.0  15.0  380.0   0.0  700.0
                                                                                           165   539   547   466   443   448   512                              0.0  30.3  18.2  461.3   0.0  849.7
  0    0.0     100.2           505   591   622   572   606   654   652   639   642          89   103    97    37    59     0     0                              3.0  26.0  15.6  395.4   0.0  728.3
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 0.00in H2O   P WB(out) = 0.00in H2O   DP(in) = 0.00in H2O   DP(out) = 0.00in H2O   FURN P = 0.00in H2O   COAL P = 0.00in H2O
   MILL=  166 F   EXIT= 1671 F   EXIT(sp)=  791 F   SMPL= 1296 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   1  ELAPSED TIME, MIN   8  RECORD ON TRK   1   FILE  24  BASELINE-UNSTAGED

240  11:50:24   97.7 16636 1956  1204  1258  1159  1246  3672  2989  3306  3220 20091     1956  6526  6661  1204  1258  1159  1246    0.12  0.51  0.91  1.21     3.7  25.0  14.6  270.0   0.0  700.0
                                                                                           169   545   551   513   569   532   571                              0.0  30.3  17.7  327.7   0.0  849.7
  0    0.0      97.8           521   653   658   640   647   671   667   650   656          63    82    80   113   117   104   116                              3.0  26.0  15.2  280.9   0.0  728.3
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 3.50in H2O   P WB(out) = 3.70in H2O   DP(in) = 0.10in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O   COAL P = 9.60in H2O
   MILL=  174 F   EXIT= 1585 F   EXIT(sp)= 1432 F   SMPL= 1275 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   2  ELAPSED TIME, MIN   6  RECORD ON TRK   1   FILE  25  INTERMEDIATE STAGING

270  12:09:54  104.0 17847 2701  1880  1867  1923  1946  2980  2450  2823  2853 21432     2701  5676  5439  1880  1867  1923  1946    0.15  0.47  0.77  1.20     3.6  26.0  15.0  240.0   0.0  750.0
                                                                                           170   535   550   584   610   572   600                              0.0  31.4  18.1  289.7   0.0  905.2
  0    0.0      97.8           522   669   670   656   661   676   671   654   663          88    70    66   177   180   179   186                              3.0  26.9  15.5  248.3   0.0  775.9
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 3.50in H2O   P WB(out) = 3.70in H2O   DP(in) = 0.10in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O   COAL P = 9.60in H2O
   MILL=  173 F   EXIT= 1558 F   EXIT(sp)= 1862 F   SMPL= 1271 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   3  ELAPSED TIME, MIN   7  RECORD ON TRK   1   FILE  26  INTERMEDIATE STAGING

459  13:41:57  101.4 17266 2638  2021  2135  2101  2165  2444  2383  2337  2394 20619     2638  4731  4827  2021  2135  2101  2165    0.15  0.43  0.71  1.19     3.5  21.0  14.8  195.0   0.0  580.0
                                                                                           174   522   526   530   591   557   597                              0.0  25.2  17.8  234.0   0.0  696.0
  0    0.0      97.8           555   675   678   664   668   683   678   652   660          86    58    57   180   202   192   206                              3.0  21.6  15.2  200.6   0.0  596.6
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 2.00in H2O   DP(in) = 0.15in H2O   DP(out) = 0.00in H2O   FURN P = 0.02in H2O   COAL P = 9.60in H2O
   MILL=  180 F   EXIT= 1515 F   EXIT(sp)= 1589 F   SMPL= 1251 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   4  ELAPSED TIME, MIN   9  RECORD ON TRK   1   FILE  27  FINAL STAGING

590  14:50:35  101.1 17206 2695  2054  2042  2123  2172  2346  2311  1977  2271 19990     2695  4248  4657  2054  2042  2123  2172    0.16  0.40  0.67  1.16     3.0  21.0  15.4  185.0   0.0  580.0
                                                                                           177   533   530   540   610  1636   621                              0.0  24.5  18.0  215.8   0.0  676.7
  0    0.0      95.4           527   692   695   682   687   699   696   666   680          88    53    55   186   197   401   211                              3.0  21.0  15.4  185.0   0.0  580.0
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 2.00in H2O   DP(in) = 0.15in H2O   DP(out) = 0.00in H2O   FURN P = 0.02in H2O   COAL P = 9.60in H2O
   MILL=  182 F   EXIT= 1501 F   EXIT(sp)= 1570 F   SMPL= 1226 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   5  ELAPSED TIME, MIN   6  RECORD ON TRK   1   FILE  28  LOW EXCESS AIR

652  15:15:21  104.2 17746 2688  2323  2388  2407  2383  2443  2555  2496  2369 22053     2688  4866  4999  2323  2388  2407  2383    0.15  0.43  0.71  1.24     4.2  20.0  14.0  220.0   0.0  500.0
                                                                                           176   531   532   538   604  1780   606                              0.0  25.0  17.5  275.0   0.0  625.0
  0    0.0      91.9           517   682   681   671   674   684   681   656   666          88    60    59   209   229   486   229                              3.0  21.4  15.0  235.7   0.0  535.7
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 2.00in H2O   DP(in) = 0.15in H2O   DP(out) = 0.00in H2O   FURN P = 0.02in H2O   COAL P = 9.60in H2O
   MILL=  182 F   EXIT= 1502 F   EXIT(sp)= 1576 F   SMPL= 1250 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   6  ELAPSED TIME, MIN   5  RECORD ON TRK   1   FILE  29  EXCESS AIR-MID

676  15:33:27   99.0 16850 2751  2343  2460  2481  2474  2250  2498  2308  2256 21829     2751  4565  4756  2343  2460  2481  2474    0.16  0.43  0.72  1.30     4.9  20.0  13.6  205.0   0.0  520.0
                                                                                           176   525   527   537   600  1436   607                              0.0  26.1  17.7  267.4   0.0  670.3
  0    0.0      91.9           518   677   678   666   672   678   676   651   661          90    56    56   210   235   424   230                              3.0  22.4  15.2  229.2   0.0  581.4
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 2.30in H2O   DP(in) = 0.15in H2O   DP(out) = 0.00in H2O   FURN P = 0.02in H2O   COAL P = 9.60in H2O
   MILL=  182 F   EXIT= 1469 F   EXIT(sp)= 1547 F   SMPL= 1225 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   7  ELAPSED TIME, MIN   6  RECORD ON TRK   1   FILE  30  HIGH EXCESS AIR
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DATE            :   07-27-83                           TER DIA        :    8
SYSTEM          :   LWS                                SPREADER       :    4"-4@20
BURNER          :   RSC  DMB                           R.H./B.P.      :    60/29.6
FUEL            :   UTAH6                              OIL  CHECK     :    94.83
________________________________________________________________________________________________________________________________________________________
            LOAD       PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL   O2    CO    CO2   NO     SO2  DUPONT
PT#   TIME  MBTU/HR TA                         FLOW SCFM                                           FLOW SCFM                         SR (CUM)                              MEASURED
  OIL         CALC  SCFM                                                               TEMP (F)            CORR TO 0% O2
(%)   LOAD    MEAS                              TEMP (F)                                           VELOCITY (FT/SEC)                                                   CORR TO 3% O2
________________________________________________________________________________________________________________________________________________________

745  16:07:54   78.7 13398 2724  1683  1740  1733  1758  1645  1673  1622  1693 16271     2724  3315  3319  1683  1740  1733  1758    0.20  0.45  0.70  1.21    3.8  25.0  14.8  170.0   0.0  540.0
                                                                                           182   531   535   521   607   551   614                              0.0  30.5  19.1  207.6   0.0  659.3
 0    0.0      75.2         534   711   716   701   706   710   715   605   695             90    41    39   149   167   158   170                              3.0  26.2  15.5  177.9   0.0  565.1
   NOZZLE =   0 in    SPREADER =   0 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.70in H20    P WB(out) = 2.00in H20    DP(in) = 0.15in H20    DP(out) = 0.00in H20    FURN P = 0.02in H20    COAL P = 9.60in H20
   MILL=  193 F   EXIT= 1389 F   EXIT(sp)= 1447 F   SMPL= 1104 F          SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
   VALID DATA POINT #   8   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  31   INTERMEDIATE LOAD

790  16:36:18   62.3 10601 2790  1412  1373  1465  1441  1106  1051  1140   936 12802     2790  2076  2237  1412  1373  1465  1441    0.26  0.46  0.67  1.21    3.7  25.0  14.6  170.0   0.0  560.0
                                                                                           195   511   519   528   614   564   643                              0.0  30.3  17.7  206.4   0.0  679.8
 0    0.0      62.0         559   752   757   743   750   758   755   716   720             94    25    26 · 126   133   135   143                              3.0  26.0  15.2  176.9   0.0  582.7
   NOZZLE =   0 in    SPREADER =   0 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 1.70in H20    P WB(out) = 2.00in H20    DP(in) = 0.15in H20    DP(out) = 0.00in H20    FURN P = 0.02in H20    COAL P = 9.60in H20
   MILL=  212 F   EXIT= 1329 F   EXIT(sp)= 1415 F   SMPL= 1001 F          SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
   VALID DATA POINT #   9   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  32   LOW LOAD
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DATE          :     07-28-83                               TER DIA        :    8
SYSTEM        :     LWS                                    SPREADER       :    4"-4@20
BURNER        :     RSC  DMB                               R.H./B.P.      :    65.0/29.7
FUEL          :     UTAH6                                  OIL  CHECK     :    97.91
_______________________________________________________________________________________________________________________________________________________
            LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2 TOTAL    O2    CO    CO2   NO    SO2  DUPONT
PT#   TIME  MBTU/HR  TA                            FLOW SCFM                                        FLOW SCFM                        SR (CUM)                            MEASURED
  OIL               CALC  SCFM                                                          TEMP (F)             CORR TO 0% O2
(%)  LOAD   MEAS                                    TEMP (F)                                        VELOCITY (FT/SEC)                                                  CORR TO 3% O2
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166  10:50:16   101.5 17281 2828   514   599     0     0  4105  4292  4199  4216 20752    2828  8415  8397   514   599     0     0    0.16  0.65  1.14  1.20     3.6  22.0  15.0 350.0   0.0  520.0
                                                                                         157   499   501   443   437   419   467                              0.0  26.6  18.1 422.4   0.0  627.6
  0     0.0     101.4           580   546   557   521   548   592   590   578   580         90   101    96    42    48     0     0                              3.0  22.8  15.5 362.1   0.0  537.9
    NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 0.00in H20   P WB(out) = 0.00in H20   DP(in) = 0.00in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P = 0.00in H20
    MILL=  158 F   EXIT= 1633 F   EXIT(sp)=  704 F   SMPL= 1292 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM'  (Ca)/(S)=  0.00
    VALID DATA POINT #   1   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  33   UNSTAGED

239  11:28:35   102.5 17457 2747  2222  2191  2143  2175  2456  2399  2587  2162 21082    2747  4749  4855  2222  2191  2143  2175    0.16  0.43  0.71  1.21     3.7  25.0  14.8 205.0   0.0  540.0
                                                                                         168   510   512   560   593   558   587                              0.0  30.3  18.0 248.8   0.0  655.5
  0     0.0      97.0           548   656   655   642   647   654   651   632   636         89    57    56   204   208   197   205                              3.0  26.0  15.4 213.3   0.0  561.8
    NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.10in H20   P WB(out) = 2.80in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.20in H20
    MILL=  174 F   EXIT= 1542 F   EXIT(sp)= 1051 F   SMPL= 1224 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
    VALID DATA POINT #   2   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  34   BASELINE

284  11:53:12   100.5 17102 2656  2200  2176  2136  2174  2459  2270  2536  2047 20653    2656  4583  4729  2200  2176  2136  2174    0.16  0.42  0.70  1.21     3.7  21.0  14.8 195.0   0.0  540.0
                                                                                         173   536   537   585   622  2438   621                              0.0  25.5  18.0 236.7   0.0  655.5
  0     0.0      97.8           573   699   700   686   690   701   696   673   680         87    57    56   207   212   558   212                              3.0  21.8  15.4 202.9   0.0  561.8
    NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.10in H20   P WB(out) = 2.80in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.20in H20
    MILL=  180 F   EXIT= 1503 F   EXIT(sp)=  732 F   SMPL= 1219 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
    VALID DATA POINT #   3   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  35   BASELINE

329  12:17:59   100.9 17169 2602  2189  2105  2134  2161  2406  2250  2515  2061 20503    2602  4576  4655  2109  2105  2134  2161    0.15  0.42  0.69  1.19     3.5  20.0  15.2 190.0   0.0  400.0
                                                                                         173   546   551   540   629  2493   626                              0.0  24.0  18.2 228.0   0.0  480.0
  0     0.0      99.0           580   717   719   705   709   720   714   691   698         85    57    56   197   214   568   211                              3.0  20.6  15.6 195.4   0.0  411.4
    NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.10in H20   P WB(out) = 2.80in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.20in H20
    MILL=  170 F   EXIT= 1527 F   EXIT(sp)= 1016 F   SMPL= 1237 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 2.00    SORBENT AIR FLOW=  198  SCFM   (Ca)/(S)=  2.06
    VALID DATA POINT #   4   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  36   LIMESTONE INJECTION-BASELINE

354  12:30:49    98.7 16799 2351  2187  2148  2116  2158  2442  2216  2495  2060 20173    2351  4555  4658  2187  2140  2116  2158    0.14  0.41  0.69  1.20     3.6  21.0  15.2 165.0   0.0  460.0
                                                                                         173   546   548   541   638   562   634                              0.0  25.3  18.3 199.1   0.0  555.2
  0     0.0      99.0           581   719   721   708   712   725   719   693   699         77    57    56   197   213   195   213                              3.0  21.7  15.7 170.7   0.0  475.9
    NOZZLE =   0 in   SPREADER =  -6 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.10in H20   P WB(out) = 2.80in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.20in H20
    MILL=  180 F   EXIT= 1481 F   EXIT(sp)=  804 F   SMPL= 1199 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 2.00    SORBENT AIR FLOW=  198  SCFM   (Ca)/(S)=  2.11
    VALID DATA POINT #   5   ELAPSED TIME, MIN   3   RECORD ON TRK   1   FILE  37   SPREADER RETRACTION

386  12:40:03    97.1 16521 2585  2100  2161  2124  2140  2417  2225  2520  2054 20413    2585  4501  4642  2100  2161  2124  2140    0.16  0.43  0.71  1.24     4.1  20.0  15.0 220.0   0.0  360.0
                                                                                         176   566   568   560   656  1826   643                              0.0  24.9  18.6 273.4   0.0  447.3
  0     0.0      99.0           590   730   731   717   720   734   726   704   708         85    59    57   200   217   437   213                              3.0  21.3  16.0 234.3   0.0  383.0
    NOZZLE =  -2 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.10in H20   P WB(out) = 2.80in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.20in H20
    MILL=  183 F   EXIT= 1530 F   EXIT(sp)=  843 F   SMPL= 1254 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 2.00    SORBENT AIR FLOW=  198  SCFM   (Ca)/(S)=  2.14
    VALID DATA POINT #   6   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  38   NOZZLE ADJUSTMENT

419  13:01:50    99.2 16805 2621  2101  2167  2110  2133  2404  2186  2456  2018 20276    2621  4474  4590  2101  2167  2110  2133    0.16  0.42  0.69  1.20     3.6  21.0  15.2 210.0   0.0  440.0
                                                                                         178   564   569   563   658  1270   650                              0.0  25.3  18.3 253.4   0.0  531.0
  0     0.0      99.0           596   734   736   722   726   737   732   709   716         86    57    56   201   218   329   213                              3.0  21.7  15.7 217.2   0.0  455.2
    NOZZLE =  -2 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 2.10in H20   P WB(out) = 2.80in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.20in H20
    MILL=  184 F   EXIT= 1551 F   EXIT(sp)= 1067 F   SMPL= 1218 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 2.00    SORBENT AIR FLOW=  198  SCFM   (Ca)/(S)=  2.10
    VALID DATA POINT #   7   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  39   REGISTER ADJUSTMENT
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DATE          :   07-28-83                          TER DIA        :   8
SYSTEM        :   LWS                               SPREADER       :   4"-4020
BURNER        :   RSC  DMB                          R.H./B.P.      :   65.0/29.7
FUEL          :   UTAH6                             OIL CHECK      :   97.91
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                  LOAD         PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2    CO   CO2    NO     SO2  DUPONT
PT0    TIME    MBTU/HR  TA                             FLOW SCFM                                          FLOW SCFM                         SR (CUM)                              MEASURED
  OIL           CALC  SCFM                                                                    TEMP (F)              CORR TO 0% O2
(%)    LOAD     MEAS                                   TEMP (F)                                          VELOCITY (FT/SEC)                                                    CORR TO 3% O2
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440  13:22:56   100.1  17036  2586  2177  2165  2110  2129  2379  2135  2494  1946  20119   2506  4440  4513  2177  2165  2110  2129    0.15  0.41  0.68  1.10     3.3  23.0  15.4  220.0   0.0  410.0
                                                                                              177   557   560   580   654  2396   653                              0.0  27.3  18.3  261.0   0.0  486.4
  0     0.0      99.0          597   742   743   730   734   747   741   715   722            05    56    55   204   217   543   214                              3.0  23.4  15.7  223.7   0.0  416.9
     NOZZLE =  -2 in   SPREADER =   0 in    IN REG =  12 DEG   OUT REG =  12 DEG   P WB(in) = 2.10in H2O   P WB(out) = 2.00in H2O   DP(in) = 0.10in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O   COAL P =10.20in H2O
     BILL=  103 F   EXIT= 1563 F   EXIT(sp)= ---- F   SMPL= 1231 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  190  SCFM   [Ca]/[S]=  2.00
     VALID DATA POINT 0   8   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  40   CLOSE REGISTERS-12

670  15:13:15    99.0  16852  2537   470   240     0     0  4250  4023  4250  4224  20012   2537  8403  8282   470   240     0     0    0.15  0.65  1.15  1.19     3.4  22.0  15.6  335.0   0.0  620.0
                                                                                              179   590   596   319   477  1574   534                              0.0  26.3  18.6  399.7   0.0  739.0
  0     0.0     103.0          504   647   640   627   650   730   726   704   710            83   111   105    33    20     0     0                              3.0  22.5  16.0  342.6   0.0  634.1
     NOZZLE =   0 in   SPREADER =   0 in    IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.10in H2O   P WB(out) = 2.00in H2O   DP(in) = 0.10in H2O   DP(out) = 0.00in H2O   FURN P = 0.01in H2O   COAL P =10.20in H2O
     BILL=  105 F   EXIT= 1597 F   EXIT(sp)= ---- F   SMPL= 1306 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT 0   9   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  41   UNSTAGED
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DATE           :    07-29-83                          TER DIA          :    8"
SYSTEM         :    LWS                               SPREADER         :    4"4020
BURNER         :    RSC DMB                           R.H./B.P.        :    76/29.6
FUEL           :    UTAH6                             OIL CHECK        :    99.31

             LOAD            PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4     PRIM  SEC1  SEC2  TOTAL     O2    CO    CO2    NO     SO2  DUPONT
PT#   TIME  MBTU/HR  TA                              FLOW SCFM                                             FLOW SCFM                            SR (CUB)                                MEASURED
 OIL          CALC  SCFM                                                                    TEMP (F)               CORR TO 0% O2
(%)   LOAD    MEAS                                    TEMP (F)                                           VELOCITY (FT/SEC)                                                          CORR TO 3% O2

200  10:45:57  101.9 17341 2719   662   658     0     0  4136  4302  4194  4272 20942    2719  8466  8438   662   658     0     0     0.16  0.64  1.13  1.21     3.7  21.0  15.2  350.0   0.0  520.0
                                                                                           160   558   554   475   521   447   499                                 0.0  25.5  18.5  424.9   0.0  631.2
 0    0.0     103.8          500   620   627   581   602   657   655   641   645            87   107   102    56    58     0     0                                 3.0  21.0  15.8  364.2   0.0  541.0
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 0.00in H20   P WB(out) = 0.00in H20   DP(in) = 0.00in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P = 0.00in H20
   MILL=  164 F   EXIT= 1609 F   EXIT(sp)= ---- F   SMPL= 1275 F              SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  1  ELAPSED TIME, MIN  6  RECORD ON TRK  1  FILE  42  UNSTAGED

338  11:40:03  103.4 17599 2656  2331  2269  2220  2250  2301  2334  2440  2216 21017    2656  4655  4635  2331  2269  2220  2250     0.15  0.42  0.60  1.19     3.5  21.0  15.2  190.0   0.0  600.0
                                                                                           164   557   558   573   646   574   627                                 0.0  25.2  18.2  228.0   0.0  720.0
 0    0.0      97.8          538   710   711   696   698   708   703   681   688            85    59    56   217   226   207   220                                 3.0  21.6  15.6  195.4   0.0  617.1
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  18 DEG   OUT REG =  18 DEG   P WB(in) = 1.70in H20   P WB(out) = 2.00in H20   DP(in) = 0.01in H20   DP(out) = 0.01in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  168 F   EXIT= 1491 F   EXIT(sp)= ---- F   SMPL= 1212 F   SORBENT= VICRON          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  2  ELAPSED TIME, MIN  10  RECORD ON TRK  1  FILE  43  BASELINE-STAGED

355  12:00:50  103.1 17554 2624  2313  2268  2232  2239  2265  2292  2442  2173 20847    2624  4614  4556  2313  2268  2232  2239     0.15  0.41  0.67  1.19     3.4  21.0  15.2  190.0   0.0  460.0
                                                                                           170   559   561   566   650   692   629                                 0.0  25.1  18.1  226.7   0.0  548.9
 0    0.0      97.8          543   717   719   703   704   716   710   686   694            85    59    56   214   227   232   220                                 3.0  21.5  15.5  194.3   0.0  470.5
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  18 DEG   OUT REG =  18 DEG   P WB(in) = 1.70in H20   P WB(out) = 2.00in H20   DP(in) = 0.01in H20   DP(out) = 0.01in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  175 F   EXIT= 1526 F   EXIT(sp)= ---- F   SMPL= 1235 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 1.30   SORBENT AIR FLOW=  217  SCFM   [Ca]/[S]=  1.02
   VALID DATA POINT #  3  ELAPSED TIME, MIN  8  RECORD ON TRK  1  FILE  44  LIMESTONE INJECTION

391  12:17:37  102.7 17475 2627  2315  2237  2211  2225  2272  2270  2406  2190 20752    2627  4596  4541  2315  2237  2211  2225     0.15  0.41  0.67  1.19     3.4  20.0  15.2  190.0   0.0  380.0
                                                                                           166   568   569   587   660  1740   639                                 0.0  23.9  18.1  226.7   0.0  453.4
 0    0.0      97.8          547   723   726   711   713   722   717   694   703            85    59    56   210   226   438   220                                 3.0  20.5  15.5  194.3   0.0  388.6
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  18 DEG   OUT REG =  18 DEG   P WB(in) = 1.70in H20   P WB(out) = 2.00in H20   DP(in) = 0.01in H20   DP(out) = 0.01in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  169 F   EXIT= 1544 F   EXIT(sp)= ---- F   SMPL= 1245 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  199  SCFM   [Ca]/[S]=  2.02
   VALID DATA POINT #  4  ELAPSED TIME, MIN  12  RECORD ON TRK  1  FILE  45  LIMESTONE INJECTION

421  12:34:46  103.0 17535 2604  2303  2258  2206  2203  2242  2240  2415  2181 20652    2604  4596  4401  2303  2258  2206  2203     0.15  0.41  0.67  1.18     3.3  22.0  15.2  200.0   0.0  370.0
                                                                                           167   568   571   582   658  1059   644                                 0.0  26.0  18.0  236.6   0.0  437.7
 0    0.0      97.8          551   729   733   719   719   728   723   699   707            84    59    55   216   227   302   219                                 3.0  22.3  15.4  202.8   0.0  375.2
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  18 DEG   OUT REG =  18 DEG   P WB(in) = 1.70in H20   P WB(out) = 2.00in H20   DP(in) = 0.01in H20   DP(out) = 0.01in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  169 F   EXIT= 1555 F   EXIT(sp)= ---- F   SMPL= 1252 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 2.60   SORBENT AIR FLOW=  175  SCFM   [Ca]/[S]=  2.87
   VALID DATA POINT #  5  ELAPSED TIME, MIN  10  RECORD ON TRK  1  FILE  46  LIMESTONE INJECTION

472  13:08:51  103.0 17533 2627  2274  2245  2187  2179  2211  2431  2492  2176 20821    2627  4668  4642  2274  2245  2187  2179     0.15  0.42  0.68  1.19     3.4  23.0  15.0  190.0   0.0  560.0
                                                                                           172   571   571   546   650  2184   646                                 0.0  27.4  17.9  226.7   0.0  668.2
 0    0.0      96.6          551   734   739   725   726   733   731   706   715            86    60    57   206   225   521   217                                 3.0  23.5  15.3  194.3   0.0  572.7
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  18 DEG   OUT REG =  18 DEG   P WB(in) = 1.70in H20   P WB(out) = 2.00in H20   DP(in) = 0.01in H20   DP(out) = 0.01in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  179 F   EXIT= 1542 F   EXIT(sp)= ---- F   SMPL= 1231 F              SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  6  ELAPSED TIME, MIN  6  RECORD ON TRK  1  FILE  47  BASELINE

495  13:18:12  102.5 17453 2599  2277  2228  2182  2184  2230  2433  2503  2190 20842    2599  4701  4672  2277  2228  2182  2184     0.15  0.42  0.69  1.19     3.5  21.0  15.0  190.0   0.0  360.0
                                                                                           172   567   560   573   663   874   654                                 0.0  25.2  18.0  228.0   0.0  432.0
 0    0.0      96.6          555   735   740   723   726   734   731   703   714            84    60    57   212   225   262   219                                 3.0  21.6  15.4  195.4   0.0  370.3
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  18 DEG   OUT REG =  18 DEG   P WB(in) = 1.70in H20   P WB(out) = 2.00in H20   DP(in) = 0.01in H20   DP(out) = 0.01in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  174 F   EXIT= 1532 F   EXIT(sp)= ---- F   SMPL= 1239 F   SORBENT= Ca(OH)2   TERT INJECTION   SORBENT SPEED= 1.90   SORBENT AIR FLOW=  208  SCFM   [Ca]/[S]=  0.98
   VALID DATA POINT #  7  ELAPSED TIME, MIN  10  RECORD ON TRK  1  FILE  48  LIME INJECTION
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DATE            :   07-29-83                        TER DIA       :   8"
SYSTEM          :   LWS                             SPREADER      :   4"4@20
BURNER          :   RSC DMB                         R.H./B.P.     :   76/29.6
FUEL            :   UTAH6                           OIL CHECK     :   99.31

                 LOAD         PRIN  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIN  SEC1  SEC2  TER1  TER2  TER3  TER4     PRIN  SEC1  SEC2  TOTAL    O2    CO    CO2   NO    SO2  DUPONT
PT#    TIME   MBTU/HR  TA                                FLOW SCFM                                            FLOW SCFM                           SR (CUM)                            MEASURED
  OIL           C'LC  SCFM                                                                           TEMP (F)          CORR TO 0% O2
(%)   LOAD      MEAS                                      TEMP (F)                                            VELOCITY (FT/SEC)                                                       CORR TO 3% O2

 520  13:30:45   101.2 17233 2584  2273  2221  2175  2184  2206  2414  2474  2164 20695     2584  4638  4619  2273  2221  2175  2184     0.15  0.42  0.69  1.20     3.6  21.0  15.0 190.0   0.0 280.0
                                                                                              173   569   566   564   653   892   847                                 0.0  25.3  18.1 229.3   0.0 337.9
   0    0.0     96.6         555   735   740   724   728   735   732   706   714               84    59    57   210   223   265   210                                 3.0  21.7  15.5 196.6   0.0 289.7
     NOZZLE =  0 in   SPREADER =  0 in   IN REG =  10 DEG   OUT REG =  10 DEG   P WB(in) = 1.70in H2O   P WB(out) = 2.00in H2O   DP(in) = 0.01in H2O   DP(out) = 0.01in H2O   FURN P = 0.00in H2O   COAL P =10.00in H2O
     MILL=  170 F   EXIT= 1543 F   EXIT(sp)= ---- F   SMPL= 1239 F   SORBENT= Ca(OH)2   TERT INJECTION   SORBENT SPEED= 2.90   SORBENT AIR FLOW=  190  SCFM   [Ca]/[S]=  2.00
     VALID DATA POINT #  8   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  49   LIME INJECTION

 575  14:03:24   101.1 17203 2611  2269  2285  2164  2175  2260  2404  2511  2213 20893     2611  4724  4744  2269  2285  2164  2175     0.15  0.43  0.70  1.21     3.8  19.0  14.6 205.0   0.0 220.0
                                                                                              174   572   564   561   660  1965   653                                 0.0  23.2  17.8 250.3   0.0 268.6
   0    0.0     96.6         558   733   738   723   728   736   733   705   715               85    61    58   209   223   473   210                                 3.0  19.9  15.3 214.5   0.0 230.2
     NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 2.00in H2O   DP(in) = 0.01in H2O   DP(out) = 0.01in H2O   FURN P = 0.00in H2O   COAL P =10.00in H2O
     MILL=  179 F   EXIT= 1565 F   EXIT(sp)= ---- F   SMPL= 1275 F   SORBENT= Ca(OH)2   TERT INJECTION   SORBENT SPEED= 3.90   SORBENT AIR FLOW=  204  SCFM   [Ca]/[S]=  3.00
     VALID DATA POINT #  9   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  50   LIME INJECTION

 575  14:03:24    99.6 16951 2592  2277  2208  2169  2172  2251  2463  2494  2197 20823     2611  4724  4744  2277  2208  2169  2172     0.15  0.43  0.71  1.23     4.0  21.0  14.6 210.0   0.0 200.0
                                                                                              174   572   564   561   660  1965   653                                 0.0  25.9  18.0 259.4   0.0 247.1
   0    0.0     96.6         555   733   737   721   726   736   733   703   712               85    61    58   209   223   474   218                                 3.0  22.2  15.5 222.4   0.0 211.0
     NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 2.00in H2O   DP(in) = 0.01in H2O   DP(out) = 0.01in H2O   FURN P = 0.00in H2O   COAL P =10.00in H2O
     MILL=  179 F   EXIT= 1565 F   EXIT(sp)= ---- F   SMPL= 1275 F   SORBENT= Ca(OH)2   TERT INJECTION   SORBENT SPEED= 5.00   SORBENT AIR FLOW=  350  SCFM   [Ca]/[S]=  4.17
     VALID DATA POINT #  10   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  51   LIME INJECTION

 627  14:35:44   101.4 17262 2581  2272  2226  2171  2181  2264  2446  2497  2209 20847     2581  4706  4710  2272  2226  2171  2181     0.15  0.42  0.69  1.21     3.7  21.0  14.6 210.0   0.0 550.0
                                                                                              170   569   550   587   659  1747   659                                 0.0  25.5  17.7 254.9   0.0 667.6
   0    0.0     96.6         555   736   739   723   728   738   734   704   713               84    60    57   214   224   432   220                                 3.0  21.8  15.2 218.5   0.0 572.3
     NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 2.00in H2O   DP(in) = 0.01in H2O   DP(out) = 0.01in H2O   FURN P = 0.00in H2O   COAL P =10.00in H2O
     MILL=  170 F   EXIT= 1544 F   EXIT(sp)= ---- F   SMPL= 1256 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #  11   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  52   BASELINE

 647  14:44:31   101.0 17199 2554  2275  2237  2195  2195  2256  2471  2503  2202 20888     2554  4705  4727  2275  2237  2195  2195     0.15  0.42  0.70  1.21     3.8  24.0  14.8 205.0   0.0 420.0
                                                                                              169   562   556   570   644   894   651                                 0.0  29.3  18.1 250.3   0.0 512.0
   0    0.0     96.6         557   734   740   722   727   739   735   706   713               83    60    57   211   223   268   220                                 3.0  25.1  15.5 214.5   0.0 439.5
     NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 2.00in H2O   DP(in) = 0.01in H2O   DP(out) = 0.01in H2O   FURN P = 0.00in H2O   COAL P =10.00in H2O
     MILL=  175 F   EXIT= 1533 F   EXIT(sp)= ---- F   SMPL= 1251 F   SORBENT= VICRON   MILL INJECTION   SORBENT SPEED= 1.30   SORBENT AIR FLOW=  215  SCFM   [Ca]/[S]=  1.04
     VALID DATA POINT #  12   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  53   LIMESTONE INJECTION-MILL

 681  14:56:53   101.2 17231 2523  2300  2242  2196  2191  2206  2464  2585  2222 20928     2523  4726  4750  2300  2242  2196  2191     0.15  0.42  0.70  1.21     3.8  21.0  14.8 205.0   0.0 320.0
                                                                                              170   576   568   589   661   929   654                                 0.0  25.6  18.1 250.3   0.0 390.7
   0    0.0     96.6         556   734   739   721   726   739   733   705   712               82    61    58   217   226   275   220                                 3.0  22.0  15.5 214.5   0.0 334.9
     NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 2.00in H2O   DP(in) = 0.01in H2O   DP(out) = 0.01in H2O   FURN P = 0.00in H2O   COAL P =10.00in H2O
     MILL=  181 F   EXIT= 1555 F   EXIT(sp)= ---- F   SMPL= 1274 F   SORBENT= VICRON   MILL INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  240  SCFM   [Ca]/[S]=  2.05
     VALID DATA POINT #  13   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  54   LIMESTONE - MILL

 712  15:10:33   101.0 17327 2482  2271  2214  2181  2182  2239  2476  2519  2244 20808     2482  4763  4716  2271  2214  2181  2182     0.14  0.42  0.69  1.20     3.6  22.0  15.0 210.0   0.0 300.0
                                                                                              170   591   583   595   674  1725   662                                 0.0  26.6  18.1 253.4   0.0 362.1
   0    0.0     96.6         558   746   748   731   735   745   742   716   723               80    62    59   216   226   429   221                                 3.0  22.8  15.5 217.2   0.0 310.3
     NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 2.00in H2O   DP(in) = 0.01in H2O   DP(out) = 0.01in H2O   FURN P = 0.00in H2O   COAL P =10.00in H2O
     MILL=  179 F   EXIT= 1582 F   EXIT(sp)= ---- F   SMPL= 1284 F   SORBENT= VICRON   MILL INJECTION   SORBENT SPEED= 2.60   SORBENT AIR FLOW=  232  SCFM   [Ca]/[S]=  2.90
     VALID DATA POINT #  14   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  55   LIMESTONE-MILL
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DATE        :   07-29-83                    TER DIA       :   8"
SYSTEM      :   LWS                         SPREADER      :   4"4@20
BURNER      :   RSC DMB                     R.H./B.P.     :   76/29.6
FUEL        :   UTAH6                       OIL CHECK     :   99.31
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------
              LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4   PRIM  SEC1  SEC2  TOTAL   O2    CO   CO2    NO    SO2  DUPONT
PT#    TIME   MBTU/HR  TA                         FLOW SCFM                                          FLOW SCFM                        SR (CUM)                                MEASURED
  OIL         CALC   SCFM                                                                 TEMP (F)              CORR TO 0% O2
(%)   LOAD    MEAS                                 TEMP (F)                                          VELOCITY (FT/SEC)                                                   CORR TO 3% O2
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

 735  15:33:25  102.7  17476  2503  2264  2204  2151  2157  2236  2489  2524  2227  20754   2503  4751  4725  2264  2204  2151  2157   0.14  0.42  0.69  1.19    3.4  21.0  15.0  210.0   0.0  470.0
                                                                                          172   595   587   606   680  1025   608                            0.0  25.1  17.9  250.6   0.0  560.0
   0     0.0    96.6         559   746   750   733   737   747   743   710   727            81    62    59   217   226   443   219                            3.0  21.5  15.3  214.0   0.0  480.7
      NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.70in H2O   P WB(out) = 2.00in H2O   DP(in) = 0.01in H2O   DP(out) = 0.01in H2O   FURN P = 0.00in H2O   COAL P =10.00in H2O
      MILL=  181 F   EXIT= 1550 F   EXIT(sp)= ---- F   SMPL= 1262 F
      VALID DATA POINT #  15   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  56   BASELINE
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DATE          :    08-01-83                                  TER DIA          :    8
SYSTEM        :    LWS                                       SPREADER         :    4"4020
BURNER        :    RSC DMB                                   R.H./E.P.        :    80/30
FUEL          :    UTAH6                                     OIL CHECK        :    93.94
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                LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2    CO    CO2    NO     SO2  DUPONT
PT#     TIME  MBTU/HR  TA                         FLOW SCFM                                                 FLOW SCFM                         SR (CUM)                                MEASURED
  OIL          CALC  SCFM                                                                     TEMP (F)               CORR TO 0% O2
(%)   LOAD     MEAS                               TEMP (F)                                               VELOCITY (FT/SEC)                                                   CORR TO 3% O2
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229  10:52:38    63.7  10052  2464   466   613     0     0  2452  2273  2467  2290  13032    2464  4765  4725   466   613     0     0    0.23  0.67  1.10  1.20     3.6  22.0  14.8  190.0   0.0  520.0
                                                                                             172   595   594   510   541   451   547                              0.0  26.6  17.9  229.3   0.0  627.6
  0     0.0    65.6            554   701   732   661   600   767   766   741   746             80    63    60    41    55     0     0                              3.0  22.8  15.3  196.6   0.0  537.9
     NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 2.10in H20   P WB(out) = 2.30in H20   DP(in) = 0.10in H20   DP(out) = 0.05in H20   FURN P = 0.01in H20   COAL P = 7.60in H20
     MILL=  170 F   EXIT= 1439 F   EXIT(sp)= 1407 F   SMPL= 1024 F            SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   1   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  70   UNSTAGED-BASELINE

326  11:39:56    63.1  10735  2616  1261  1267  1309  1382  1407  1098  1307  1236  12965    2616  2544  2506  1261  1267  1309  1382    0.24  0.48  0.71  1.21     3.7  30.0  14.8  155.0   0.0  560.0
                                                                                             175   490   500   524   592   551   595                              0.0  36.4  18.0  188.2   0.0  679.8
  0     0.0    63.2            509   682   689   674   677   685   679   652   661             85    30    29   112   120   126   131                              3.0  31.2  15.4  161.3   0.0  582.7
     NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 2.10in H20   P WB(out) = 2.30in H20   DP(in) = 0.10in H20   DP(out) = 0.05in H20   FURN P = 0.01in H20   COAL P = 7.60in H20
     MILL=  102 F   EXIT= 1342 F   EXIT(sp)= 1569 F   SMPL=  993 F            SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   2   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  71   BASELINE-STAGED

350  11:53:15    60.9  10362  2580  1269  1300  1324  1273  1346  1024  1223  1175  12514    2580  2390  2371  1269  1300  1324  1273    0.25  0.40  0.71  1.21     3.7  30.0  14.8  160.0   0.0  500.0
                                                                                             175   499   511   484   612   506   600                              0.0  36.4  18.0  194.2   0.0  606.9
  0     0.0    63.2            524   708   718   702   704   713   706   676   687             84    29    28   108   126   115   122                              3.0  31.2  15.4  166.5   0.0  520.2
     NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 2.10in H20   P WB(out) = 2.30in H20   DP(in) = 0.10in H20   DP(out) = 0.05in H20   FURN P = 0.01in H20   COAL P = 7.60in H20
     MILL=  101 F   EXIT= 1377 F   EXIT(sp)= 1606 F   SMPL= 1007 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 1.00    SORBENT AIR FLOW=  245  SCFM   [Ca]/[S]=  1.01
     VALID DATA POINT #   3   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  72   LIMESTONE INJECTION-TERTS

377  12:08:47    61.7  10508  2559  1195  1298  1311  1270  1343   995  1206  1157  12342    2559  2363  2330  1195  1298  1311  1270    0.24  0.47  0.69  1.17     3.2  30.0  15.2  150.0   0.0  400.0
                                                                                             179   505   521   478   613  1204   617                              0.0  35.4  17.9  177.0   0.0  471.9
  0     0.0    63.2            532   725   737   720   724   732   724   692   704             84    28    27   101   125   196   124                              3.0  30.3  15.4  151.7   0.0  404.5
     NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 2.10in H20   P WB(out) = 2.30in H20   DP(in) = 0.10in H20   DP(out) = 0.05in H20   FURN P = 0.01in H20   COAL P = 7.60in H20
     MILL=  107 F   EXIT= 1389 F   EXIT(sp)= 1613 F   SMPL= 1007 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 1.40    SORBENT AIR FLOW=  212  SCFM   [Ca]/[S]=  1.94
     VALID DATA POINT #   4   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  73   LIMESTONE-TERTS

399  12:23:39    61.9  10541  2512  1195  1283  1305  1277  1344   995  1199  1136  12246    2512  2335  2339  1195  1283  1305  1277    0.24  0.46  0.68  1.16     3.0  35.0  15.4  140.0   0.0  340.0
                                                                                             184   512   523   513   631   533   629                              0.0  40.8  18.0  163.3   0.0  396.7
  0     0.0    63.2            539   731   743   725   731   738   730   697   710             83    28    27   105   126   117   125                              3.0  35.0  15.4  140.0   0.0  340.1
     NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 2.10in H20   P WB(out) = 2.30in H20   DP(in) = 0.10in H20   DP(out) = 0.05in H20   FURN P = 0.01in H20   COAL P = 7.60in H20
     MILL=  194 F   EXIT= 1401 F   EXIT(sp)= 1058 F   SMPL= 1016 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 1.80    SORBENT AIR FLOW=  191  SCFM   [Ca]/[S]=  2.88
     VALID DATA POINT #   5   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  74   LIMESTONE-TERTS

464  12:56:55    61.7  10508  2588  1239  1296  1308  1269  1429  1038  1250  1203  12619    2588  2453  2467  1239  1296  1308  1269    0.25  0.48  0.71  1.20     3.6  35.0  14.8  160.0   0.0  500.0
                                                                                             181   492   502   472   589   507   586                              0.0  42.2  17.9  193.1   0.0  603.4
  0     0.0    63.2            505   682   689   677   680   688   681   653   666             85    29    28   104   122   114   120                              3.0  36.2  15.3  165.5   0.0  517.2
     NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 2.10in H20   P WB(out) = 2.30in H20   DP(in) = 0.10in H20   DP(out) = 0.05in H20   FURN P = 0.01in H20   COAL P = 7.60in H20
     MILL=  186 F   EXIT= 1378 F   EXIT(sp)=  976 F   SMPL= 1027 F            SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
     VALID DATA POINT #   6   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  75   BASELINE

482  13:06:41    64.4  10965  2705  1299  1377  1383  1360  1511  1090  1320  1271  13317    2705  2592  2601  1299  1377  1383  1360    0.25  0.40  0.72  1.21     3.0  32.0  14.6  170.0   0.0  300.0
                                                                                             174   496   509   452   593   930   596                              0.0  39.1  17.8  207.6   0.0  366.3
  0     0.0    63.2            406   699   709   694   698   705   697   669   681             80    31    30   107   131   173   129                              3.0  33.5  15.3  177.9   0.0  314.0
     NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 2.10in H20   P WB(out) = 2.30in H20   DP(in) = 0.10in H20   DP(out) = 0.05in H20   FURN P = 0.01in H20   COAL P = 7.60in H20
     MILL=  177 F   EXIT= 1380 F   EXIT(sp)=  971 F   SMPL= 1041 F   SORBENT= Ca(OH)2    TERT INJECTION    SORBENT SPEED= 1.50    SORBENT AIR FLOW=  292  SCFM   [Ca]/[S]=  0.93
     VALID DATA POINT #   7   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  76   LIME INJECTION-TERTS
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DATE          :  08-01-83                            TER DIA         :  8
SYSTEM        :  LWS                                 SPREADER        :  4"4@20
BURNER        :  RSC DMB                             R.H./B.P.       :  62.0/30.0
FUEL          :  UTAH6                               OIL CHECK       :  93.94
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              LOAD         PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4   PRIM  SEC1  SEC2 TOTAL   O2    CO    CO2   NO     SO2  DUPONT
PT#    TIME  MBTU/HR  TA                       FLOW SCFM                                              FLOW SCFM                                SR (CUM)                            MEASURED
 OIL          CALC  SCFM                                                                 TEMP (F)                CORR TO 0% O2
(%)   LOAD    MEAS                              TEMP (F)                                              VELOCITY (FT/SEC)                                                          CORR TO 3% O2
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.512 13:22:49   62.6 10659 2678  1283  1293  1320  1266  1464  1076  1274  1218 12872    2678  2492  2540  1283  1293  1320  1266   0.25  0.49  0.72  1.21    3.7  32.0  14.8  170.0   0.0  260.0
                                                                                          175   511   524   504   620   589   625                              0.0  38.8  18.0  206.4   0.0  315.6
 0     0.0      63.2          436   735   745   730   733   742   732   700   713          88    30    30   111   126   125   124                              3.0  33.3  15.4  176.9   0.0  270.5
     NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.10in H20    P WB(out) = 2.30in H20    DP(in) = 0.10in H20    DP(out) = 0.05in H20    FURN P = 0.01in H20    COAL P = 7.60in H20
     MILL=  180 F   EXIT= 1402 F   EXIT(sp)=  971 F   SMPL= 1044 F   SORBENT= Ca(OH)2    TERT INJECTION    SORBENT SPEED= 2.10    SORBENT AIR FLOW=  129  SCFM   (Ca)/(S)=  1.93
     VALID DATA POINT #   8   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  77   LINE -TERTS

 544 13:37:31   62.9 10707 2669  1252  1284  1311  1244  1449  1049  1259  1199 12716    2669  2457  2498  1252  1204  1311  1244   0.25  0.48  0.71  1.19    3.4  32.0  15.0  160.0   0.0  240.0
                                                                                          175   527   538   519   638  1173   643                              0.0  38.2  17.9  190.9   0.0  286.4
 0     0.0      63.2          449   752   764   746   749   760   751   716   731          87    30    30   110   127   193   124                              3.0  32.7  15.3  163.6   0.0  245.5
     NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.10in H20    P WB(out) = 2.30in H20    DP(in) = 0.10in H20    DP(out) = 0.05in H20    FURN P = 0.01in H20    COAL P = 7.60in H20
     MILL=  179 F   EXIT= 1408 F   EXIT(sp)= 1649 F   SMPL= 1042 F   SORBENT= Ca(OH)2    TERT INJECTION    SORBENT SPEED= 2.70    SORBENT AIR FLOW=  146  SCFM   (Ca)/(S)=  2.89
     VALID DATA POINT #   9   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  78   LINE-TERTS

 564 13:50:07   61.4 10445 2553  1260  1288  1305  1244  1442  1064  1250  1207 12614    2553  2457  2506  1260  1288  1305  1244   0.24  0.48  0.72  1.21    3.7  32.0  14.6  165.0   0.0  480.
                                                                                          172   529   540   535   646  1172   645                              0.0  38.8  17.7  200.3   0.0  582.
 0     0.0      63.2          461   757   769   752   755   764   755   722   736          83    30    30   113   128   192   124                              3.0  33.3  15.2  171.7   0.0  499.4
     NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.10in H20    P WB(out) = 2.30in H20    DP(in) = 0.10in H20    DP(out) = 0.05in H20    FURN P = 0.01in H20    COAL P = 7.60in H2
     MILL=  177 F   EXIT= 1401 F   EXIT(sp)= 1633 F   SMPL= 1044 F              SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
     VALID DATA POINT #  10   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  79   BASELINE

 622 14:21:39   62.6 10656 2563  1219  1287  1308  1248  1424  1025  1242  1201 12516    2563  2443  2449  1219  1287  1308  1248   0.24  0.47  0.70  1.17    3.2  36.0  15.2  150.0   0.0  540.0
                                                                                          173   528   540   544   633  1080   649                              0.0  42.5  17.9  177.0   0.0  637.1
 0     0.0      63.2          486   762   776   760   761   772   763   726   742          83    30    29   110   127   182   125                              3.0  36.4  15.4  151.7   0.0  546.1
     NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.10in H20    P WB(out) = 2.30in H20    DP(in) = 0.10in H20    DP(out) = 0.05in H20    FURN P = 0.01in H20    COAL P = 7.60in H20
     MILL=  181 F   EXIT= 1387 F   EXIT(sp)= 1626 F   SMPL= 1029 F              SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
     VALID DATA POINT #  11   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  80   BASELINE

 636 14:28:49   60.5 10298 2520  1200  1279  1306  1235  1410  1042  1242  1202 12436    2520  2444  2452  1200  1279  1306  1235   0.24  0.48  0.72  1.21    3.7  34.0  15.0  180.0   0.0  460.0
                                                                                          175   527   543   530   632  1100   648                              0.0  41.3  18.2  218.5   0.0  558.4
 0     0.0      63.2          492   763   777   761   763   773   765   728   743          82    30    29   108   126   194   123                              3.0  35.4  15.6  187.3   0.0  478.6
     NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.10in H20    P WB(out) = 2.30in H20    DP(in) = 0.10in H20    DP(out) = 0.05in H20    FURN P = 0.01in H20    COAL P = 7.60in H20
     MILL=  184 F   EXIT= 1365 F   EXIT(sp)= 1621 F   SMPL= 1029 F   SORBENT= VICRON    MILL INJECTION    SORBENT SPEED= 1.00    SORBENT AIR FLOW=  214  SCFM   (Ca)/(S)=  1.02
     VALID DATA POINT #  12   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  81   LIMESTONE-MILL

 669 14:40:28   62.4 10623 2501  1196  1274  1288  1233  1426  1017  1229  1177 12342    2501  2406  2443  1196  1274  1288  1233   0.24  0.46  0.69  1.16    3.0  35.0  15.8  150.0   0.0  380.0
                                                                                          177   533   542   558   643  1058   661                              0.0  40.8  18.4  175.0   0.0  443.3
 0     0.0      63.2          498   764   777   761   765   774   767   728   745          82    30    29   110   127   176   125                              3.0  35.0  15.8  150.0   0.0  380.0
     NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.10in H20    P WB(out) = 2.30in H20    DP(in) = 0.10in H20    DP(out) = 0.05in H20    FURN P = 0.01in H20    COAL P = 7.60in H20
     MILL=  187 F   EXIT= 1410 F   EXIT(sp)= 1645 F   SMPL= 1054 F   SORBENT= VICRON    MILL INJECTION    SORBENT SPEED= 1.40    SORBENT AIR FLOW=  201  SCFM   (Ca)/(S)=  1.92
     VALID DATA POINT #  13   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  82   LIMESTONE-MILL

 694 15:01:09   61.9 10536 2533  1204  1264  1293  1250  1418  1035  1243  1202 12444    2533  2445  2453  1204  1264  1293  1250   0.24  0.47  0.71  1.18    3.3  32.0  15.6  170.0   0.0  320.0
                                                                                          177,  535   543   573   654   638   664                              0.0  38.0  18.5  201.7   0.0  379.7
 0     0.0      63.2          504   764   777   759   765   774   766   729   745          83    30    29   112   127   128   127                              3.0  32.5  15.9  172.9   0.0  325.4
     NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.10in H20    P WB(out) = 2.30in H20    DP(in) = 0.10in H20    DP(out) = 0.05in H20    FURN P = 0.01in H20    COAL P = 7.60in H20
     MILL=  184 F   EXIT= 1407 F   EXIT(sp)= 1659 F   SMPL= 1060 F   SORBENT= VICRON    MILL INJECTION    SORBENT SPEED= 1.00'   SORBENT AIR FLOW=  179  SCFM   (Ca)/(S)=  2.08
     VALID DATA POINT #  14   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  83   LIMESTONE-MILL
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DATE          :   08-01-83                                       TER DIA        :   8
SYSTEM        :   LWS                                            SPREADER       :   4"4@20
BURNER        :   RSC  DMB                                       R.H./B.P.      :   62.0/30.0
FUEL .        :   UTAH6                                          OIL  CHECK     :   93.94

                  LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4      PRIM  SEC1  SEC2 TOTAL     O2    CO    CO2   NO     SO2  DUPONT
PT#     TIME   MBTU/HR  TA                                 FLOW SCFM                                           FLOW SCFM                             SR (CUM)                          MEASURED
  OIL                CALC  SCFM                                                                    TEMP (F)                CORR 10 0% O2
(%)    LOAD          MEAS                                 TEMP (F)                                          VELOCITY (FT/SEC)                                                          CORR TO 3% O2

787  15:10:37    61.3 10438 2545  1192  1271  1296  1243  1414  1025  1233  1176 12396     2545  2489  2440  1192  1271  1296  1243     0.24  0.47  0.71  1.19     3.4  37.0  15.2 160.0   0.0 500.0
                                                                                            177   523   533   547   628  1158   656                              0.0  44.1  18.1 190.9   0.0 596.6
  0     0.0      63.2            504   764   777   759   764   775   766   729   744           83    30    29   108   125   189   125                              3.0  37.8  15.5 163.6   0.0 511.4
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.10in H2O    P WB(out) = 2.30in H2O    DP(in) = 0.10in H2O    DP(out) = 0.05in H2O    FURN P = 0.01in H2O    COAL P = 7.60in H2O
    MILL=  105 F   EXIT= 1384 F   EXIT(sp)= 1632 F   SMPL= 1040 F             SORBENT SPEED= 0.00    SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
    VALID DATA POINT #  15   ELAPSED TIME, MIN   9   RECORD ON TRK   1   FILE  04   BASELINE

815  15:40:10    65.1 11082 3065  1262  1325  1355  1316  1306  1059  1105  1361 13234     3065  2546  2365  1262  1325  1355  1316     0.20  0.51  0.72  1.19     3.5  35.0  15.2 170.0   0.0 530.0
                                                                                            140   544   556   586   669   640   670                              0.0  42.0  18.2 204.0   0.0 636.0
  0     0.0      63.2            210   779   792   773   770   700   700   742   761           96    32    29   119   135   134   135                              3.0  36.0  15.6 174.9   0.0 545.1
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.10in H2O    P WB(out) = 2.30in H2O    DP(in) = 0.10in H2O    DP(out) = 0.05in H2O    FURN P = 0.01in H2O    COAL P = 7.60in H2O
    MILL=  130 F   EXIT= 1309 F   EXIT(sp)= 1631 F   SMPL= 1050 F             SORBENT SPEED= 0.00    SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
    VALID DATA POINT #  16   ELAPSED TIME, MIN  20   RECORD ON TRK   1   FILE  05   503 TEST

850  16:25:49    62.2 10593 2720  1207  1269  1293  1212  1274  1030  1150  1145 12307     2720  2294  2304  1207  1269  1293  1212     0.26  0.47  0.69  1.16     3.0  36.0  15.4 150.0   0.0 560.0
                                                                                            175   537   542   567   650  1320   660                              0.0  42.0  18.0 175.0   0.0 653.3
  0     0.0      63.2            474   774   786   760   774   784   776   737   753           89    29    28   112   127   287   123                              3.0  36.0  15.4 150.0   0.0 560.0
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.10in H2O    P WB(out) = 2.30in H2O    DP(in) = 0.10in H2O    DP(out) = 0.05in H2O    FURN P = 0.01in H2O    COAL P = 7.60in H2O
    MILL=  106 F   EXIT= 1400 F   EXIT(sp)=  430 F   SMPL= 1049 F             SORBENT SPEED= 0.00    SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
    VALID DATA POINT #  17   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  06   BASELINE

866  16:33:13    61.7 10507 2737  1214  1264  1292  1220  1207  1033  1150  1136 12341     2737  2294  2320  1214  1264  1292  1220     0.26  0.40  0.70  1.17     3.2  35.0  15.4 160.0   0.0 500.0
                                                                                            177   540   550   536   666  1163   663                              0.0  41.3  18.2 188.9   0.0 589.9
  0     0.0      63.2            400   774   786   767   773   783   775   737   753           90    29    28   109   120   109   123                              3.0  35.4  15.6 161.0   0.0 505.6
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.10in H2O    P WB(out) = 2.30in H2O    DP(in) = 0.10in H2O    DP(out) = 0.05in H2O    FURN P = 0.01in H2O    COAL P = 7.60in H2O
    MILL=  107 F   EXIT= 1399 F   EXIT(sp)=  442 F   SMPL= 1057 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 1.00    SORBENT AIR FLOW=  230  SCFM   (Ca)/(S)=  1.00
    VALID DATA POINT #  18   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  07   LIMESTONE - TERTS

886  16:47:12    63.0 10724 2803  1245  1283  1325  1250  1313  1060  1107  1191 12665     2803  2370  2373  1245  1283  1325  1250     0.26  0.40  0.70  1.18     3.3  35.0  15.4 155.0   0.0 330.0
                                                                                            170   553   559   570   601  1191   673                              0.0  41.5  18.3 183.9   0.0 391.5
  0     0.0      63.2            383   776   789   770   775   784   770   740   750           92    30    29   115   132   197   120                              3.0  35.6  15.7 157.6   0.0 335.4
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.10in H2O    P WB(out) = 2.30in H2O    DP(in) = 0.10in H2O    DP(out) = 0.05in H2O    FURN P = 0.01in H2O    COAL P = 7.60in H2O
    MILL=  108 F   EXIT= 1405 F   EXIT(sp)=  439 F   SMPL= 1060 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 2.00    SORBENT AIR FLOW=  194  SCFM   (Ca)/(S)=  3.30
    VALID DATA POINT #  19   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  08   LIMESTONE-TERTS

197  11:11:27    99.5 16934 2736   500   553     0     0  4209  4083  4052  4201 20335     2736  8253  8293   500   553     0     0     0.16  0.65  1.14  1.28     3.6  22.0  15.0 320.0   0.0 560.0
                                                                                            161   510   521   460   442 10032   470                              0.0  26.6  18.1 386.2   0.0 675.9
  0     0.0     100.2            520   574   587   557   573   640   721   714   609           87   101    97    42    45     0     0                              3.0  22.0  15.5 331.0   0.0 579.3
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  20 DEG    OUT REG =  20 DEG    P WB(in) = 4.05in H2O    P WB(out) = 4.65in H2O    DP(in) = 0.02in H2O    DP(out) =-0.03in H2O    FURN P = 0.01in H2O    COAL P = 9.20in H2O
    MILL=  166 F   EXIT= 1610 F   EXIT(sp)= 1004 F   SMPL= 1301 F             SORBENT SPEED= 0.00    SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
    VALID DATA POINT #   1   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  90   BASELINE-UNSTAGED
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DATE        :  08-02-83                              TER DIA      :  8
SYSTEM      :  LWS                                   SPREADER     :  4"-4020
BURNER      :  RSC DMB                               R.H./B.P.    :  78.0/29.6
FUEL        :  UTAH6                                 OIL CHECK    :  96.76
----------------------------------------------------------------------------------------------------------------------------------------------
             LOAD         PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2 TOTAL    O2    CO   CO2    NO   SO2 DUPONT
PT#   TIME  MBTU/HR  TA                           FLOW SCFM                                              FLOW SCFM                            SR (CUM)                                MEASURED
  OIL        CALC  SCFM                                                                  TEMP (F)                  CORR TO 0% O2
(%)   LOAD   MEAS                                 TEMP (F)                                              VELOCITY (FT/SEC)                                                      CORR TO 3% O2
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197 11:11:27   99.5 16934 2736   500   553     0     0  4289  4003  4052  4201 20335   2736  8253  8293   580   553     0     0    0.16  0.65  1.14  1.20    3.6  22.0  15.0 320.0   0.0 560.0
                                                                                      161   510   521   460   442 10032   470                              0.0  26.6  18.1 306.2   0.0 675.9
 0    0.0   100.2          520   574   587   557   573   640   721   714   687           87   181    97    42    45     0     0                              3.0  22.0  15.5 331.0   0.0 579.3
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 4.05in H2O   P WB(out) = 4.65in H2O   DP(in) = 0.02in H2O   DP(out) =-0.03in H2O   FURN P = 0.01in H2O   COAL P = 9.20in H2O
   MILL=  166 F   EXIT= 1610 F   EXIT(sp)= 1004 F   SMPL= 1301 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   1   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  90   BASELINE-UNSTAGED

260 11:43:40  103.2 17562 2585  2267  2294  2200  2159  2494  2294  2325  2355 20972   2585  4679  4708  2267  2294  2200  2159    0.15  0.41  0.69  1.19    3.5  25.0  15.0 180.0   0.0 580.0
                                                                                      166   512   517   555   583 10032   585                              0.0  30.0  18.0 216.0   0.0 696.0
 0    0.0    97.0          540   650   661   647   652   660   656   635   643           83    57    56   207   216  3664   203                              3.0  25.7  15.4 185.1   0.0 596.6
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 1.20in H2O   P WB(out) = 1.40in H2O   DP(in) = 0.01in H2O   DP(out) =-0.01in H2O   FURN P = 0.01in H2O   COAL P =10.10in H2O
   MILL=  172 F   EXIT= 1579 F   EXIT(sp)= 1507 F   SMPL= 1253 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   2   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  91   BASELINE-STAGED

397 12:36:25  102.1 17304 2620  2230  2259  2167  2162  2457  2197  2376  2204 20760   2620  4659  4654  2230  2259  2167  2162    0.15  0.42  0.69  1.19    3.5  21.0  15.2 180.0   0.0 580.0
                                                                                      171   539   546   610   620 10032   622                              0.0  25.2  18.2 216.0   0.0 696.0
 0    0.0    95.4          571   700   703   690   692   701   694   671   680           85    58    56   216   221  3610   211                              3.0  21.6  15.6 185.1   0.0 596.6
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 1.20in H2O   P WB(out) = 1.40in H2O   DP(in) = 0.01in H2O   DP(out) =-0.01in H2O   FURN P = 0.01in H2O   COAL P =10.10in H2O
   MILL=  175 F   EXIT= 1525 F   EXIT(sp)= 1575 F   SMPL= 1240 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   3   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  92   SO3 TEST-STAGED BASELINE

485 13:37:11  100.5 17115 2601  2249  2266  2161  2139  2446  2107  2371  2206 20707   2601  4650  4632  2249  2266  2161  2139    0.16  0.43  0.70  1.21    3.0  22.0  15.0 185.0   0.0 560.0
                                                                                      174   544   553   605   630 10032   624                              0.0  26.9  18.3 225.9   0.0 683.7
 0    0.0    95.4          536   705   706   695   695   704   698   675   684           87    58    56   216   223  3600   209                              3.0  23.0  15.7 193.6   0.0 586.0
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 1.20in H2O   P WB(out) = 1.40in H2O   DP(in) = 0.01in H2O   DP(out) =-0.01in H2O   FURN P = 0.01in H2O   COAL P =10.10in H2O
   MILL=  182 F   EXIT= 1510 F   EXIT(sp)= 1579 F   SMPL= 1245 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   4   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  93   BASELINE-STAGED

551 14:16:07  101.5 17287 2619  2237  2254  2176  2147  2444  2143  2366  2250 20643   2619  4624  4587  2237  2254  2176  2147    0.15  0.42  0.68  1.19    3.5  22.0  15.0 180.0   0.0 550.0
                                                                                      172   533   542   579   618 10032   622                              0.0  26.4  18.0 216.0   0.0 660.0
 0    0.0    95.4          535   700   704   690   692   699   694   671   681           85    57    55   209   219  3625   209                              3.0  22.6  15.4 185.1   0.0 565.7
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 1.20in H2O   P WB(out) = 1.40in H2O   DP(in) = 0.01in H2O   DP(out) =-0.01in H2O   FURN P = 0.01in H2O   COAL P =10.10in H2O
   MILL=  177 F   EXIT= 1530 F   EXIT(sp)= 1580 F   SMPL= 1252 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   5   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  94   SO3 TEST/HI VOL/BASELINE-STAGED

583 14:33:11  101.9 17339 2646  2236  2262  2175  2141  2442  2153  2340  2302 20705   2646  4650  4594  2236  2262  2175  2141    0.15  0.42  0.69  1.19    3.5  23.0  15.0 185.0   0.0 550.0
                                                                                      171   540   546   570   626 10032   621                              0.0  27.6  18.0 222.0   0.0 660.0
 0    0.0    95.4          534   699   702   690   691   699   694   670   679           86    58    55   209   221  3623   208                              3.0  23.7  15.4 190.3   0.0 565.7
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 1.20in H2O   P WB(out) = 1.40in H2O   DP(in) = 0.01in H2O   DP(out) =-0.01in H2O   FURN P = 0.01in H2O   COAL P =10.10in H2O
   MILL=  179 F   EXIT= 1515 F   EXIT(sp)= 1583 F   SMPL= 1249 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   6   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  95   BASELINE-STAGED

701 15:28:25  102.3 17400 2706  2225  2247  2160  2136  2449  2107  2396  2274 20789   2706  4670  4636  2225  2247  2160  2136    0.16  0.42  0.69  1.19    3.5  25.0  15.0 190.0   0.0 560.0
                                                                                      173   537   542   582   623  2314   618                              0.0  30.0  18.0 228.0   0.0 672.0
 0    0.0    95.4          535   690   700   687   689   695   691   668   677           88    58    56   209   219   542   208                              3.0  25.7  15.4 195.4   0.0 576.0
   NOZZLE =   0 in   SPREADER =   0 in   IN REG = '15 DEG   OUT REG =  15 DEG   P WB(in) = 1.20in H2O   P WB(out) = 1.40in H2O   DP(in) = 0.01in H2O   DP(out) =-0.01in H2O   FURN P = 0.01in H2O   COAL P =10.10in H2O
   MILL=  181 F   EXIT= 1553 F   EXIT(sp)= 1501 F   SMPL= 1251 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   7   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  96   BASELINE-SO3 TEST
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DATE          :   08-02-83                          TER DIA      :   8
SYSTEM        :   LWS                               SPREADER     :   4"-4020
BURNER        :   RSC DMB                           R.H./B.P.    :   54/29.6
FUEL          :   UTAH6                             OIL CHECK    :   96.76
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                LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2    CO    CO2    NO     SO2   DUPONT
PT0    TIME   MBTU/HR  TA                       FLOW SCFM                                                FLOW SCFM                          SR (CUM)                               MEASURED
  OIL           CALC  SCFM                                                             TEMP (F)               CORR TO 0% O2
(%)    LOAD     MEAS                            TEMP (F)                                           VELOCITY (FT/SEC)                                                        CORR TO 3% O2
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850  16:49:58   102.0 17506 2652  2225  2246  2150  2144  2449  2169  2363  2277  20675    2640  4654  4603  2225  2246  2150  2144    0.15  0.42  0.60  1.10     3.3   23.0  15.2  105.0   0.0  560.0
                                                                                           172   536   546   602   620  2006   623                               0.0   27.3  10.0  219.5   0.0  664.4
  0     0.0      95.4         535   697   700   680   689   696   691   669   670            86    58    55   213   220   473   209                               3.0   23.4  15.5  100.1   0.0  569.5
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 1.20in H2O   P WB(out) = 1.40in H2O   DP(in) = 0.01in H2O   DP(out) =-0.01in H2O   FURN P = 0.01in H2O   COAL P =10.10in H2O
   MILL=  179 F   EXIT= 1549 F   EXIT(sp)= 1606 F   SMPL= 1263 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT 0   8   ELAPSED TIME, MIN   0   RECORD ON TRK   1   FILE  86   BASELINE-METHOD 5

850  16:49:58   103.0 17535 2640  2237  2254  2160  2154  2451  2152  2367  2287  20710    2640  4654  4603  2237  2254  2160  2154    0.15  0.42  0.60  1.10     3.3   23.0  15.2  190.0   0.0  580.0
                                                                                           172   536   546   602   620  2006   623                               0.0   27.3  10.0  225.4   0.0  688.1
  0     0.0      95.4         535   694   699   686   687   693   689   667   675            86    58    55   214   221   496   210                               3.0   23.4  15.5  193.2   0.0  589.0
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 1.20in H2O   P WB(out) = 1.40in H2O   DP(in) = 0.01in H2O   DP(out) =-0.01in H2O   FURN P = 0.01in H2O   COAL P =10.10in H2O
   MILL=  179 F   EXIT= 1549 F   EXIT(sp)= 1606 F   SMPL= 1263 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT 0   9   ELAPSED TIME, MIN   0   RECORD ON TRK   1   FILE  97   BASELINE
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DATE      :  08-03-83                        TER DIA      :  8"
SYSTEM    :  LWS                             SPREADER     :  4"40/20
BURNER    :  RS DMB                          R.H./B.P.    :  85/30.71
FUEL      :  UTAH6                           OIL CHECK    :  96.76

                LOAD          PRIM  V -2  ~~V-3~~ ~~V-4~~ V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2    CO    CO2    NO    SO2  DUPONT
PT#    TIME   MBTU/HR  TA                                FLOW SCFM                                          FLOW SCFM                          SR (CDM)                              MEASURED
  OIL           CALC  SCFM                                                                      TEMP (F)                CORR TO 0% O2
(%)    LOAD     MEAS                                     TEMP (F)                                          VELOCITY (FT/SEC)                                                        CORR TO 3% O2

635  11:02:47   98.5 16762 2770   739   683     0     0  4321  3077  4025  4059 20473    2770  8084  8190   739   683     0     0    0.17  0.65  1.14  1.22     3.9  22.0  14.8  310.0    0.0  560.0
                                                                                          156   512   518   445   475   929   430                              0.0  27.0  18.2  380.7    0.0  687.7
  0   0.0     97.8            492   599   606   566   564   632   628   613   618          08    98    96    60    58     0     0                              3.0  23.2  15.6  326.3    0.0  589.5
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 6.00in H20   P WB(out) = 7.00in H20   DP(in) = 0.10in H20   DP(out) =-0.60in H20   FURN P = 0.10in H20   COAL P =10.10in H20
   MILL=  159 F   EXIT= 1614 F   EXIT(sp)= 1579 F   SMPL= 1277 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   1   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  57   UNSTAGED


701  11:33:07  100.9 17183 2770  2201  2243  2223  2120  2327  2326  2270  2262 20751    2770  4532  4653  2201  2243  2223  2120    0.16  0.42  0.70  1.21     3.7  25.0  15.0  175.0    0.0  560.0
                                                                                          163   528   529   608   616  1443   602                              0.0  30.3  18.2  212.4    0.0  679.8
  0   0.0     95.4            525   672   674   659   661   670   666   645   653          89    56    55   212   217   381   204                              3.0  26.0  15.6  182.1    0.0  582.7
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.10in H20
   MILL=  169 F   EXIT= 1554 F   EXIT(sp)= 1582 F   SMPL= 1248 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   2   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  58   STAGED-BASELINE


830  12:44:43  101.7 17308 2655  2211  2182  2152  2160  2312  2432  2321  2352 20785    2655  4673  4743  2211  2182  2152  2160    0.15  0.42  0.70  1.20     3.6  22.0  15.2  185.0    0.0  390.0
                                                                                          170   555   552   735   635 18032   621                              0.0  26.6  18.3  223.3    0.0  470.7
  0   0.0     95.4            541   702   704   692   694   702   696   673   682          86    59    57   238   215  3586   211                              3.0  22.8  15.7  191.4    0.0  403.0
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.10in H20
   MILL=  176 F   EXIT= 1549 F   EXIT(sp)= 1600 F   SMPL= 1254 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  192  SCFM   [Ca]/[S]=  2.04
   VALID DATA POINT #   3   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  59   LIMESTONE INJECTION-TERTS


885  13:10:16  104.7 17821 2586  2198  2185  2149  2143  2323  2448  2335  2338 20704    2586  4673  4771  2198  2185  2149  2143    0.15  0.41  0.68  1.16     3.0  22.0  15.4  180.0    0.0  400.0
                                                                                          160   550   548   685   626 18032   621                              0.0  25.7  18.0  210.0    0.0  466.7
  0   0.0     95.4            537   698   700   689   690   696   692   670   679          84    59    57   227   214  3579   209                              3.0  22.0  15.4  180.0    0.0  400.0
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.10in H20
   MILL=  170 F   EXIT= 1579 F   EXIT(sp)= 1621 F   SMPL= 1280 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  192  SCFM   [Ca]/[S]=  1.99
   VALID DATA POINT #   4   ELAPSED TIME, MIN  10   RECORD ON TRK   1   FILE  60   BASELINE/LIMESTONE/S03/M5


1066  14:44:38   99.5 16937 2656  2217  2161  2114  2077  2274  2420  2306  2347 20570    2656  4653  4693  2217  2161  2114  2077    0.16  0.43  0.71  1.21     3.8  25.0  15.2  165.0    0.0  500.0
                                                                                          180   528   535   537   605 18032   598                              0.0  30.5  18.6  201.5    0.0  610.5
  0   0.0     97.8            532   697   699   687   688   695   691   666   676          87    57    56   199   207  3521   198                              3.0  26.2  15.9  172.7    0.0  523.3
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.10in H20
   MILL=  187 F   EXIT= 1512 F   EXIT(sp)= 1550 F   SMPL= 1238 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   5   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  61   BASELINE-NO LIMESTONE


1139  15:25:16  100.1 17037 2645  2138  2189  2130  2104  2334  2200  2283  2323 20345    2645  4606  4534  2138  2189  2130  2104    0.16  0.43  0.69  1.19     3.5  25.0  15.4  170.0    0.0  560.0
                                                                                          172   537   542   541   617 18032   607                              0.0  30.0  18.5  204.0    0.0  672.0
  0   0.0     97.8            529   694   699   687   688   694   690   667   676          86    57    54   193   212  3548   202                              3.0  25.7  15.8  174.9    0.0  576.0
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 1.40in H20   P WB(out) = 1.40in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.01in H20   COAL P =10.10in H20
   MILL=  181 F   EXIT= 1523 F   EXIT(sp)= 1586 F   SMPL= 1246 F           SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   6   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  62   BASELINE-NO INJECTION
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DATE          :   08-03-83                                         TER DIA        :   8"
SYSTEM        :   LWS                                              SPREADER       :   4"40/20
BURNER        :   RS  DMB                                          R.H./B.P.      :   85/30.71
FUEL          :   UTAH6                                            OIL  CHECK     :   96.76
----------------------------------------------------------------------------------------------------------------------------------------------------------------
              LOAD           PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIM  SEC1  SEC2  TOTAL    O2    CO   CO2    NO     SO2  DUPONT
PT#   TIME   MBTU/HR  TA                                 FLOW SCFM                                          FLOW SCFM                        SR (CUM)                              MEASURED
  OIL         CALC  SCFM                                                                   TEMP (F)               CORR TO 0% O2
(%)   LOAD    MEAS                                       TEMP (F)                                       VELOCITY (FT/SEC)                                                      CORR TO 3% O2
----------------------------------------------------------------------------------------------------------------------------------------------------------------

1186  15:45:27   97.4 16583 2677  2122  2195  2133  2098  2338  2137  2271  2284 20254    2677  4555  4474  2122  2195  2133  2098    0.16  0.44  0.71  1.22     3.9  24.0  15.0 190.0    0.0 400.0
                                                                                           173   535   545   618   620 10032   615                               0.0  29.5  18.4 233.3    0.0 491.2
 0    0.0     95.4           533   697   701   689   689   696   691   669   678            87    57    54   206   214  3553   203                               3.0  25.3  15.8 200.0    0.0 421.1
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 1.40in H20    P WB(out) = 1.40in H20    DP(in) = 0.10in H20    DP(out) = 0.00in H20    FURN P = 0.01in H20    COAL P =10.10in H2'
    MILL=  180 F   EXIT= 1536 F   EXIT(sp)= 1598 F   SMPL= 1256 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 2.00    SORBENT AIR FLOW=  192  SCFM   [Ca]/[S]=  2.13
    VALID DATA POINT #   7   ELAPSED TIME, MIN  15   RECORD ON TRK   1   FILE  63   LIMESTONE-TERTS/SO3/METHOD 5

1256  16:24:46   97.5 16597 2695  2119  2170  2118  2087  2389  2068  2171  2227 20044    2695  4398  4457  2119  2170  2118  2087.   0.16  0.43  0.70  1.21     3.7  25.0  15.2 190.6    0.0 410.0
                                                                                           174   523   531   574   606  2453   609                               0.0  30.3  18.5 230.6    0.0 497.7
 0    0.0     95.4           533   695   697   686   688   696   689   666   676            88    54    53   197   208   556   201                               3.0  26.0  15.8 197.7    0.0 426.6
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 1.40in H20    P WB(out) = 1.40in H20    DP(in) = 0.10in H20    DP(out) = 0.00in H20    FURN P = 0.01in H20    COAL P =10.10in H20
    MILL=  183 F   EXIT= 1556 F   EXIT(sp)= 1610 F   SMPL= 1266 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 2.00    SORBENT AIR FLOW=  192  SCFM   [Ca]/[S]=  2.13
    VALID DATA POINT #   8   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  64   LIMESTONE INJECTIO N

1295  16:40:22   96.0 16486 2656  2126  2163  2108  2067  2355  2046  2170  2218 19909    2656  4389  4400  2126  2163  2108  2067    0.16  0.43  0.69  1.21     3.7  25.0  15.2 200.0    0.0 280.0
                                                                                           174   535   543   518   614  2289   612                               0.0  30.3  18.5 242.0    0.0 339.9
 0    0.0     95.4           533   697   694   688   690   696   691   669   678            87    54    53   187   209   522   200                               3.0  26.0  15.8 208.1    0.0 291.3
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 1.40in H20    P WB(out) = 1.40in H20    DP(in) = 0.10in H20    DP(out) = 0.00in H20    FURN P = 0.01in H20    COAL P =10.10in H20
    MILL=  184 F   EXIT= 1554 F   EXIT(sp)= 1612 F   SMPL= 1268 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 3.00    SORBENT AIR FLOW=  300  SCFM   [Ca]/[S]=  3.66
    VALID DATA POINT #   9   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  65   LIMESTONE INJECTION-VELOCITY INCREASE
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DATE        :   08-04-83                                      TER DIA        :   12
SYSTEM      :   LWS                                           SPREADER       :   4"-4020
BURNER      :   RSC  DMB                                      R.H./B.P.      :   62/29.7
FUEL        :   UTAH6                                         OIL CHECK      :   96.44

                 LOAD          PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4     PRIM  SEC1  SEC2  TOTAL     O2    CO    CO2    NO     SO2  DUPONT
PT#    TIME    MBTU/HR  TA                            FLOW SCFM                                                FLOW SCFM                                SR (CUM)                          MEASURED
  OIL          CALC  SCFM                                                                       TEMP (F)              CORR TO 0% O2
(%)    LOAD    MEAS                                  TEMP (F)                                           VELOCITY (FT/SEC)                                                              CORR TO 3% O2

160  11:26:21    97.9  16663  2777   515   430     0     0  4262  4087  4005  4277  20353    2777  8282  8349   515   430     0     0     0.17  0.66  1.16  1.22     3.9  22.0  14.6  310.0    0.0  540.0
                                                                                            155   516   526   427   442   130   441                               0.0  27.0  17.9  380.7    0.0  663.2
 0     0.0    101.4             486   566   578   551   572   616   615   602   605             88   101    98    18    16     0     0                               3.0  23.2  15.4  326.3    0.0  568.4
   NOZZLE =   0 in   SPREADER =  0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 0.00in H20   P WB(out) = 0.00in H20   DP(in) = 0.00in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P = 0.00in H20
   MILL=  159 F   EXIT= 1616 F   EXIT(sp)= 1698 F   SMPL= 1280 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   1   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  66   UNSTAGED

274  12:20:25    99.2  16895  2706  1952  1811  1862  1827  2783  2628  2659  2768  20996    2706  5427  5411  1952  1811  1862  1827     0.16  0.40  0.80  1.24     4.2  27.0  14.4  200.0    0.0  530.0
                                                                                            171   532   536   526   593   544   579                               0.0  33.8  18.0  250.0    0.0  662.5
 0     0.0     96.6             532   679   683   670   674   683   680   658   666             88    67    64    77    76    75    76                               3.0  20.9  15.4  214.3    0.0  567.9
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  170 F   EXIT= 1529 F   EXIT(sp)= 1736 F   SMPL= 1221 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   2   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  67   BASELINE-STAGED

324  12:43:57    99.0  16850  2620  1783  1849  1804  1832  2768  2568  2650  2746  20700    2620  5396  5336  1783  1849  1804  1832     0.16  0.40  0.79  1.23     4.0  27.0  14.6  210.0    0.0  360.0
                                                                                            169   547   548   523   608   541   580                               0.0  33.4  18.0  259.4    0.0  444.7
 0     0.0     96.6             530   690   695   681   685   698   692   668   677             85    68    64    70    79    76    76                               3.0  28.6  15.5  222.4    0.0  381.2
   NOZZLE =   0 in   SPREADER =   0 in   IN.REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  174 F   EXIT= 1586 F   EXIT(sp)= 1814 F   SMPL= 1266 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  327  SCFM   [Ca]/[S]=  2.10
   VALID DATA POINT #   3   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  68   LIMESTONE-HIGH VELOCITY

353  13:03:14    97.8  16657  2682  1793  1775  1804  1729  2775  2584  2650  2788  20581    2682  5439  5359  1793  1775  1804  1729     0.16  0.49  0.81  1.24     4.1  25.0  14.6  210.0    0.0  400.0
                                                                                            170   544   550   495   594   516   141                               0.0  31.1  18.1  260.9    0.0  497.0
 0     0.0     96.6             536   692   695   682   687   698   694   672   681             87    68    65    69    75    70    42                               3.0  26.6  15.6  223.7    0.0  426.0
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  177 F   EXIT= 1562 F   EXIT(sp)= 1799 F   SMPL= 1262 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 1.50   SORBENT AIR FLOW=  357  SCFM   [Ca]/[S]=  1.30
   VALID DATA POINT #   4   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  69   LIMESTONE-HIGH VELOCITY

408  13:31:57    99.7  16969  2709  1815  1766  1811  1738  2782  2577  2629  2782  20609    2709  5411  5359  1815  1766  1811  1738     0.16  0.48  0.79  1.21     3.8  25.0  15.0  200.0    0.0  540.0
                                                                                            172   548   553   507   605   519   131                               0.0  30.5  18.3  244.2    0.0  659.3
 0     0.0     96.6             536   692   697   684   686   698   692   671   681             88    68    65    70    75    71    41                               3.0  26.2  15.7  209.3    0.0  565.1
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(id) = 2.20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  180 F   EXIT= 1570 F   EXIT(sp)= 1760 F   SMPL= 1247 F          SORBENT SPEED= 0.00   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #   5   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  70   BASELINE

427  13:42:03   100.0  17026  2632  1804  1764  1795  1738  2773  2536  2637  2767  20446    2632  5404  5308  1804  1764  1795  1738     0.15  0.47  0.78  1.20     3.6  26.0  15.1  200.0    0.0  440.0
                                                                                            173   549   555   514   604   526   144                               0.0  31.4  18.2  241.4    0.0  531.0
 0     0.0     96.6             534   692   695   685   687   697   692   671   680             86    68    64    70    75    71    42                               3.0  26.9  15.6  206.9    0.0  455.2
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  180 F   EXIT= 1595 F   EXIT(sp)= 1612 F   SMPL= 1253 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  220  SCFM   [Ca]/[S]=  2.08
   VALID DATA POINT #   6   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  71   INTERMEDIATE VELOCITY-LIMESTONE
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DATE      :  08-04-83                         TER DIA       :  12
SYSTEM    :  LWS                              SPREADER      :  4"-4@20
BURNER    :  RSC DMB                          R.H./B.P.     :  62/29.7
FUEL      :  UTAH6                            OIL CHECK     :  96.44
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            LOAD             PRIN  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIN  SEC1  SEC2  TER1  TER2  TER3  TER4   PRIN  SEC1  SEC2  TOTAL   O2   CO    CO2   NO     SO2  DUPONT
PT0   TIME  MBTU/HR  TA                          FLOW SCFM                                               FLOW SCFM                          SR (CUM)                               MEASURED
  OIL        CALC  SCFM                                                               TEMP (F)                  CORR TO 0% O2
(%)  LOAD    MEAS                                TEMP (F)                                           VELOCITY (FT/SEC)                                                         CORR TO 3% O2
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473  14:08:21  100.2 17054 2666  1742  1798  1799  1727  2813  2529  2634  2770  20479   2666  5405  5342  1742  1798  1799  1727   0.16  0.47  0.79  1.20    3.6  25.0  14.8  200.0   0.0  470.0
                                                                                          173   545   550   517   607   526   146                              0.0  30.2  17.9  241.4   0.0  567.2
 0    0.0    96.6          533   680   692   682   685   696   691   668   678             87    68    64    68    77    71    42                              3.0  25.9  15.3  206.9   0.0  486.2
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  102 F   EXIT= 1581 F   EXIT(sp)= 1621 F   SMPL= 1244 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 1.50   SORBENT AIR FLOW=  229  SCFM   [Ca]/[S]=  1.34
   VALID DATA POINT #  7  ELAPSED TIME, MIN  10  RECORD ON TRK  1  FILE  72  INTERMEDIATE VELOCITY-LIMESTONE

481  14:17:30   99.4 16930 2640  1680  1814  1803  1745  2821  2514  2637  2783  20445   2640  5420  5335  1688  1814  1803  1745   0.16  0.48  0.79  1.21    3.7  25.0  14.8  200.0   0.0  540.0
                                                                                          175   539   547   511   593   525   153                              0.0  30.3  18.0  242.8   0.0  655.5
 0    0.0    96.6          532   686   693   681   685   693   689   668   670             86    67    64    66    77    71    43                              3.0  26.0  15.4  208.1   0.0  561.8
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  104 F   EXIT= 1584 F   EXIT(sp)= 1620 F   SMPL= 1263 F            SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  8  ELAPSED TIME, MIN  5  RECORD ON TRK  1  FILE  73  BASELINE

513  14:33:04  101.0 17336 2634  1713  1785  1761  1746  2823  2495  2631  2773  20362   2634  5404  5319  1713  1785  1761  1746   0.15  0.46  0.77  1.17    3.2  25.0  15.0  200.0   0.0  600.0
                                                                                          174   536   545   530   589   533   150                              0.0  29.5  17.7  236.0   0.0  707.9
 0    0.0    96.6          530   685   691   679   683   692   689   667   676             86    67    64    68    75    70    43                              3.0  25.3  15.2  202.2   0.0  606.7
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  101 F   EXIT= 1600 F   EXIT(sp)= 1616 F   SMPL= 1235 F            SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  9  ELAPSED TIME, MIN  5  RECORD ON TRK  1  FILE  74  BASELINE

553  14:51:12  101.4 17260 2610  1756  1753  1744  1742  2812  2513  2634  2812  20385   2610  5446  5325  1756  1753  1744  1742   0.15  0.47  0.78  1.18    3.3  22.0  15.0  200.0   0.0  460.0
                                                                                          176   540   553   533   606   536   150                              0.0  26.1  17.8  237.3   0.0  545.8
 0    0.0    96.6          533   686   692   679   684   694   690   668   678             86    68    64    70    75    70    43                              3.0  22.4  15.3  203.4   0.0  467.8
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  105 F   EXIT= 1612 F   EXIT(sp)= 1642 F   SMPL= 1248 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 2.00   SORBENT AIR-FLOW=  115  SCFM   [Ca]/[S]=  2.05
   VALID DATA POINT #  10  ELAPSED TIME, MIN  10  RECORD ON TRK  1  FILE  75  LIMESTONE-LOW VELOCITY

604  15:19:07  100.0 17031 2665  1740  1757  1745  1752  2802  2493  2613  2772  20338   2665  5385  5296  1740  1757  1745  1752   0.16  0.47  0.78  1.19    3.5  25.0  14.8  210.0   0.0  500.0
                                                                                          175   538   540   517   593   524   145                              0.0  30.0  17.8  252.0   0.0  600.0
 0    0.0    95.4          531   692   696   685   690   699   694   672   682             87    67    64    68    74    69    42                              3.0  25.7  15.2  216.0   0.0  514.3
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  104 F   EXIT= 1573 F   EXIT(sp)= 1640 F   SMPL= 1243 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 1.50   SORBENT AIR FLOW=  104  SCFM   [Ca]/[S]=  1.35
   VALID DATA POINT #  11  ELAPSED TIME, MIN  7  RECORD ON TRK  1  FILE  76  LIMESTONE-LOW VELOCITY

644  15:43:53  100.0 17152 2634  1753  1758  1750  1757  2813  2473  2632  2799  20369   2634  5431  5286  1753  1758  1750  1757   0.15  0.47  0.78  1.19    3.4  20.0  14.8  220.0   0.0  440.0
                                                                                          176   542   551   510   599   521   142                              0.0  23.9  17.7  262.5   0.0  525.0
 0    0.0    95.4          532   691   697   685   689   690   694   672   682             86    68    64    68    75    69    42                              3.0  20.5  15.1  225.0   0.0  450.0
   NOZZLE =  0 in   SPREADER =  0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  105 F   EXIT= 1663 F   EXIT(sp)= 1644 F   SMPL= 1269 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  198  SCFM   [Ca]/[S]=  2.06
   VALID DATA POINT #  12  ELAPSED TIME, MIN  5  RECORD ON TRK  1  FILE  77  LIMESTONE-VELOCITY TEST
```

```
DATE          :   08-04-83                       TER DIA       :   12
SYSTEM        :   LWS                            SPREADER      :   4"-4020
BURNER        :   RSC  DMB                       R.H./B.P.     :   62/29.7
FUEL          :   UTAH6                          OIL CHECK     :   96.44
--------------------------------------------------------------------------------------------------------------------------------------------------------------------
                 LOAD         PRIM  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL   PRIM  SEC1  SEC2  TER1  TER2  TER3  TER4   PRIM  SEC1  SEC2 TOTAL   O2   CO    CO2    NO    SO2 DUPONT
PT#    TIME  MBTU/HR  TA                             FLOW SCFM                                           FLOW SCFM                          SR (CUM)                              MEASURED
 OIL          *CALC  SCFM                                                                   TEMP (F)               CORR TO 0% O2
(%)   LOAD     MEAS                                  TEMP (F)                                         VELOCITY (FT/SEC)                                                     CORR TO 3% O2
--------------------------------------------------------------------------------------------------------------------------------------------------------------------

677  15:50:40   101.2 17227 2603  1756  1749  1720  1731  2015  2459  2615  2703 20233   2603  5399  5274  1756  1749  1720  1731   0.15  0.46  0.77  1.17   3.2  20.0  14.8 2215.0   0.0 440.0
                                                                                          177   545   553   527   611   550   151                            0.0  23.6  17.5 2613.2   0.0 519.1
 0     0.0     95.4         535   689   692   684   689   699   695   673   683            85    60    64    69    75    70    42                            3.0  20.2  15.0 2239.9   0.0 444.9
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H2O
   MILL=  105 F   EXIT= 1643 F   EXIT(sp)= 1645 F   SMPL= 1200 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 2.00   SORBENT AIR FLOW=  276  SCFM   [Ca]/[S]=  2.05
   VALID DATA POINT #  13   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  78   LIMESTONE-VELOCITY TEST


688  16:07:06    99.9 16999 2649  1763  1755  1737  1737  2795  2446  2628  2790 20300   2649  5417  5241  1763  1755  1737  1737   0.16  0.47  0.78  1.19   3.5  22.0  14.8  215.0   0.0 560.0
                                                                                          177   550   554   525   613   546   151                            0.0  26.4  17.8  258.0   0.0 672.0
 0     0.0     95.4         533   690   696   685   680   699   695   672   682            87    68    64    70    75    70    43                            3.0  22.6  15.2  221.1   0.0 576.1
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  20 DEG   OUT REG =  20 DEG   P WB(in) = 2.20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  104 F   EXIT= 1606 F   EXIT(sp)= 1636 F   SMPL= 1275 F            SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  14   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  79   BASELINE


772  16:51:26    66.1 11261 2670  1191  1163  1142  1198  1407  1501  1433  1370 13083   2670  2011  2900  1191  1163  1142  1198   0.24  0.49  0.74  1.16   3.0  30.0  15.2  165.0   0.0 540.0
                                                                                          159   582   573   553   655   587   142                            0.0  35.0  17.7  192.5   0.0 630.0
 0     0.0     66.8         423   776   790   774   781   790   790   752   765            85    37    36    48    52    48    29                            3.0  30.0  15.2  165.0   0.0 540.0
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 2:20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H2C
   MILL=  166 F   EXIT= 1398 F   EXIT(sp)= 1463 F   SMPL= 1075 F            SORBENT SPEED= 0.00   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
   VALID DATA POINT #  15   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  80   BASELINE-LOW LOAD


790  17:05:25    63.8 10856 2630  1194  1153  1129  1192  1307  1504  1420  1354 12964   2630  2774  2892  1194  1153  1129  1192   0.24  0.50  0.76  1.19   3.5  25.0  15.0  185.0   0.0 370.0
                                                                                          169   589   580   554   664   581   138                            0.0  30.0  18.0  222.0   0.0 444.0
 0     0.0     66.8         450   792   805   788   795   805   802   764   770            85    36    36    49    52    47    29                            3.0  25.7  15.4  190.3   0.0 380.6
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 2.20in H20   P WB(out) = 2.50in H20   DP(in) = 0.10in H20   DP(out) = 0.00in H20   FURN P = 0.00in H20   COAL P =10.00in H20
   MILL=  177 F   EXIT= 1383 F   EXIT(sp)= 1441 F   SMPL= 1064 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 1.50   SORBENT AIR FLOW=  261  SCFM   [Ca]/[S]=  2.11
   VALID DATA POINT #  16   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  81   LOW LOAD-HIGH VELOCITY


808  17:13:26    64.4 10955 2626  1188  1145  1121  1194  1384  1498  1417  1365 12938   2626  2781  2882  1188  1145  1121  1194   0.24  0.49  0.76  1.18   3.3  26.0  15.0  185.0   0.0 400.0
                                                                                          172   599   587   577   673   602   141                            0.0  30.8  17.8  219.5   0.0 474.6
 0     0.0     66.0         458   797   811   794   800   811   808   767   782            85    37    36    49    52    48    29                            3.0  26.4  15.3  188.1   0.0 406.8
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 1.10in H20   P WB(out) = 1.10in H20   DP(in) = 0.05in H20   DP(out) = 0.00in H20   FURN P = 0.04in H20   COAL P = 7.60in H20
   MILL=  180 F   EXIT= 1401 F   EXIT(sp)= 1437 F   SMPL= 1069 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 1.50   SORBENT AIR FLOW=  165  SCFM   [Ca]/[S]=  2.09
   VALID DATA POINT #  17   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  82   LOW LOAD-INTERMEDIATE VELOCITY


817  17:20:51    64.1 10911 2610  1189  1134  1116  1185  1388  1495  1411  1360 12886   2610  2770  2883  1189  1134  1116  1185   0.24  0.49  0.76  1.18   3.3  26.0  15.0  185.0   0.0 400.0
                                                                                          174   604   589   582   685   600   137                            0.0  30.8  17.8  219.5   0.0 569.5
 0     0.0     66.8         460   800   814   799   805   813   812   772   786            85    37    36    50    52    47    28                            3.0  26.4  15.3  188.1   0.0 408.1
   NOZZLE =   0 in   SPREADER =   0 in   IN REG =  15 DEG   OUT REG =  15 DEG   P WB(in) = 1.10in H20   P WB(out) = 1.10in H20   DP(in) = 0.05in H20   DP(out) = 0.00in H20   FURN P = 0.04in H20   COAL P = 7.60in H20
   MILL=  105 F   EXIT= 1399 F   EXIT(sp)= 1442 F   SMPL= 1062 F   SORBENT= VICRON   TERT INJECTION   SORBENT SPEED= 1.50   SORBENT AIR FLOW=   98  SCFM   [Ca]/[S]=  2.10
   VALID DATA POINT #  18   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  83   LOW LOAD-LOW VELOCITY
```

```
DATE         :  08-04-83                          TER DIA        :   12
SYSTEM       :  LWS                               SPREADER       :   4"-4@20
BURNER       :  RSC  DMB                          R.H./B.P.      :   62/29.7
FUEL         :  UTAH6                             OIL CHECK      :   96.44
----------------------------------------------------------------------------------------------------------------------------------------------------------------
              LOAD          PRIN  V -2  V -3  V -4  V -5  V -6  V -7  V -8  V -9  TOTAL    PRIN  SEC1  SEC2  TER1  TER2  TER3  TER4    PRIN  SEC1  SEC2  TOTAL    O2    CO    CO2    NO    SO2  DUPONT
PT#    TIME  MBTU/HR  TA                          FLOW SCFM                                            FLOW SCFM                              SR (CUM)                                MEASURED
  OIL          CALC  SCFM                                                                   TEMP (F)              CORR TO 0% O2
(%)    LOAD    MEAS                                TEMP (F)                                             VELOCITY (FT/SEC)                                                         CORR TO 3% O2
----------------------------------------------------------------------------------------------------------------------------------------------------------------

826  17:24:24   64.4 10971 2614  1186  1140  1118  1192  1393  1409  1412  1342 12806     2614  2754  2882  1186  1140  1118  1192    0.24  0.49  0.75  1.17     3.2  30.0  15.0  180.0   0.0  380.0
                                                                                           174   602   590   576   682   597   138                                0.0  35.4  17.7  212.4   0.0  448.1
 0     0.0      66.8          462   800   811   799   806   814   814   773   780           85    36    36    49    52    47    29                                3.0  30.3  15.2  182.0   0.0  384.3
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 1.10in H2O    P WB(out) = 1.10in H2O    DP(in) = 0.05in H2O    DP(out) = 0.00in H2O    FURN P = 0.04in H2O    COAL P = 7.60in H2O
    MILL=  104 F   EXIT= 1309 F   EXIT(sp)= 1444 F   SMPL= 1064 F   SORBENT= VICRON    TERT INJECTION    SORBENT SPEED= 1.50    SORBENT AIR FLOW=   97  SCFM   [Ca]/[S]=  2.09
    VALID DATA POINT #  19   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  04   LOW LOAD-LOW VELOCITY

772  16:51:26   65.5 11152 2684  1197  1137  1120  1181  1305  1504  1405  1346 12007     2670  2811  2900  1197  1137  1128  1181    0.24  0.47  0.73  1.16     2.9  30.0  15.2  170.0   0.0  540.0
                                                                                           159   582   573   553   655   587   142                                0.0  34.8  17.6  197.2   0.0  626.5
 0     0.0      66.0          466   803   819   802   800   816   814   773   791           85    37    36    49    51    47    28                                3.0  29.8  15.1  169.1   0.0  537.0
    NOZZLE =   0 in    SPREADER =   0 in    IN REG =  15 DEG    OUT REG =  15 DEG    P WB(in) = 2.20in H2O    P WB(out) = 2.50in H2O    DP(in) = 0.10in H2O    DP(out) = 0.00in H2O    FURN P = 0.00in H2O    COAL P =10.00in H2O
    MILL=  166 F   EXIT= 1390 F   EXIT(sp)= 1463 F   SMPL= 1075 F             SORBENT SPEED= 0.00    SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
    VALID DATA POINT #  20   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  05   BASELINE
```

DATA SUPPLEMENT FOR SORBENT INJECTION TESTS ON 7-28-83 WITH RSC DMB AND UTAH COAL.

DATE	BURNER	DATA PT. # ON VALID SUMMARY	O_2 (%)	SO_2, ppm (@ 0% O_2)	SORBENT	INJECTION LOCATION	Ca/S	CAPTURE (%)
7-28-85	RSC DMB	284	3.7	561.8	---	---	---	---
7-28-83	RSC DMB	354	3.6	475.9	Vicron	Tertiaries	2.11	17.8
7-28-83	RSC DMB	386	4.1	383.4	Vicron	Tertiaries	2.14	33.8
7-28-83	RSC DMB	419	3.6	455.2	Vicron	Tertiaries	2.10	21.5
7-28-83	RSC DMB	448	3.3	416.1	Vicron	Tertiaries	2.08	28.1
7-28-83	RSC DMB	---*	3.2	597	---	---	---	---

* The final baseline was taken off the strip chart immediately after the sorbent injection tests were completed at 14:35 and was not included in the Valid Data Summary. Therefore, the baseline value for calculating SO_2 capture is:

$$\frac{561.8 + 597}{2} = 579.4$$

This value was used to calculate the corresponding capture rates.

APPENDIX D

CCV AND FLARE TEST DATA

This appendix includes all valid test data obtained during the second phase of the test and evaluation program for the CCV and Flare burners. The data presented are computer listings of the data with the headings at the top of the page describing the formatted numbers below. The formatting of the data was designed for use by the test engineer to present all data characterizing each test condition as completely as possible. This results in a very dense packing of information and much abbreviation. The introduction to Appendix C defines and explains the formatted data in the computer lists.

```
DATE           :  04-04-84                                   TER DIA      :  8
SYSTEM         :  LWS                                        SPREADER     :  BL CONE
BURNER         :  CCV-100                                    B.P/R.H.     :  0
FUEL           :  UTAH9                                      OIL CHECK    :  -3.70

                LOAD           PRIM   V-2    V-3    V-4    V-5    V-8    V-7    TOTAL    PRIM   SEC  TER1  TER2  TER3  TER4      PRIM     SEC      TOTAL        O2    CO    CO2    NO    SO2
PT0    TIME   MBTU/HR  TA                              FLOW SCFM                                    FLOW SCFM                            SR (CUM)                                MEASURED
 OIL            CALC  SCFM                                                                          TEMP (F)                                                              CORR TO 0% O2
(%)    LOAD     MEAS                                   TEMP (F)                                  VELOCITY (FT/SEC)                                                        CORR TO 3% O2

406  13:41:31  100.4 16672  2714    100   4342   4271   177    4139   4395   20130    2714 17147   50    50    88    88       0.16     1.20     1.21        3.7   45.0  16.6  270.0  540.0
                                                                                       152   587  938   340   357   411                                     0.0   54.6  20.2  327.7  655.5
  0    0.0     101.1          566    184    664    657    510    642    656              89   112    7     4     7     7                                     3.0   46.8  17.3  280.9  561.8
K-TRON=0200 LBS/HR     REGISTER POSITION=  27 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 587 F    WINDBOX P= 9.00IN H20    FURNACE P= 0.09IN H20    COAL P= 5.00IN H20
MILL IN=  493 F   MILL OUT= 153 F   EXIT= 1421 F   EXIT(sp)= 1600 F   SMPL= 1106 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0  1   ELAPSED TIME, MIN   9   RECORD ON TRK   0   FILE   1   BASELINE-UNSTAGED

517  13:57:55   90.5 16361  2754      0   4371   4296   189    4121   4257   19988    2754 17045    0     0    95    95       0.17     1.22     1.22        3.9   43.0  16.6  290.0  530.0
                                                                                       152   586  956   345   351   410                                     0.0   52.8  20.4  356.1  650.9
  0    0.0     101.1          569    170    662    658    508    643    659              90   112    0     0     7     8                                     3.0   45.3  17.5  305.3  557.9
K-TRON=0200 LBS/HR     REGISTER POSITION=  27 DEG   SPREADER POSITION=  -9.0 IN   WINDBOX T= 586 F    WINDBOX P= 9.00IN H20    FURNACE P= 0.14IN H20    COAL P= 5.00IN H20
MILL IN=  400 F   MILL OUT= 153 F   EXIT= 1396 F   EXIT(sp)= 1507 F   SMPL= 1088 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0  2   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE   2   SPREADER RETRACTION

872  14:24:59   99.5 16512  2691     71   4364   4284   116    4103   4235   19945    2691 17067   36    36    50    50       0.16     1.21     1.21        3.7   40.0  16.6  295.0  540.0
                                                                                       151   586  853   351   418   426                                     0.0   48.6  20.2  358.1  655.5
  0    0.0     101.1          546    174    663    660    499    641    642              88   112    4     3     5     5                                     3.0   41.6  17.3  306.9  561.8
K-TRON=0200 LBS/HR     REGISTER POSITION=  27 DEG   SPREADER POSITION= -12.0 IN   WINDBOX T= 586 F    WINDBOX P= 9.00IN H20    FURNACE P= 0.14IN H20    COAL P= 5.00IN H20
MILL IN=  490 F   MILL OUT= 152 F   EXIT= 1397 F   EXIT(sp)= 1592 F   SMPL= 1094 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0  3   ELAPSED TIME, MIN   9   RECORD ON TRK   0   FILE   3   SPREADER RETRACTION

628  14:59:03   90.0 16400  2838      0   4391   4313   150    4156   4187   20036    2838 17040    0     0    75    75       0.17     1.22     1.22        3.9   45.0  15.6  255.0  520.0
                                                                                       151   595  921   324   406   405                                     0.0   55.3  19.2  313.2  638.6
  0    0.0     103.6          469    176    671    660    505    651    664              92   113    0     0     6     6                                     3.0   47.4  16.4  268.4  547.4
K-TRON=0400 LBS/HR     REGISTER POSITION=  27 DEG   SPREADER POSITION=   0.0 IN   WINDBOX T= 595 F    WINDBOX P= 9.00IN H20    FURNACE P= 0.20IN H20    COAL P= 3.20IN H20
MILL IN=  413 F   MILL OUT= 153 F   EXIT= 1423 F   EXIT(sp)= 1593 F   SMPL= 1100 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0  3   ELAPSED TIME, MIN   8   RECORD ON TRK   0   FILE   4   SPREADER RETRACTION

655  15:14:05   90.5 16350  2761      0   4415   4330   133    4182   4154   19976    2761 17081    0     0    67    67       0.17     1.22     1.22        3.9   40.0  15.4  270.0  540.0
                                                                                       151   595  822   345   478   430                                     0.0   49.1  18.9  331.6  663.2
  0    0.0     103.6          519    170    672    664    511    652    665              90   113    0     0     6     6                                     3.0   42.1  16.2  284.2  568.4
K-TRON=0400 LBS/HR     REGISTER POSITION=  27 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 595 F    WINDBOX P= 9.00IN H20    FURNACE P= 0.25IN H20    COAL P= 4.00IN H20
MILL IN=  464 F   MILL OUT= 160 F   EXIT= 1409 F   EXIT(sp)= 1490 F   SMPL= 1090 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0  4   ELAPSED TIME, MIN   8   RECORD ON TRK   0   FILE   5   BASELINE

678  15:27:43   90.5 16355  2765      0   4042   4348     0    4157   4899   20212    2765 17447  214   214   212   212       0.17     1.22     1.24        4.1   40.0  15.0  360.0  580.0
                                                                                       152   591  757   367   619   460                                     0.0   49.7  18.6  447.3  720.7
  0    0.0     103.6          492    179    664    658    506    644    659              90   115   24    17    21    18                                     3.0   42.6  16.0  383.4  617.8
K-TRON=0400 LBS/HR     REGISTER POSITION=  35 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 591 F    WINDBOX P= 4.00IN H20    FURNACE P= 0.25IN H20    COAL P= 4.00IN H20
MILL IN=  460 F   MILL OUT= 151 F   EXIT= 1329 F   EXIT(sp)=   89 F   SMPL= 1112 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0  5   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE   6   REGISTER

727  15:56:07   96.2 15969  2702      0   4006   4101   240    3980   4179   19209    2702 16346    0     0   120   120       0.17     1.21     1.21        3.7   40.0  15.4  255.0  540.0
                                                                                       150   601  722   352   630   448                                     0.0   48.6  18.7  309.5  655.5
  0    0.0     103.6          547    192    682    679    512    662    677              88   109    0     0    12    10                                     3.0   41.6  16.0  265.3  561.8
K-TRON=0400 LBS/HR     REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 601 F    WINDBOX P= 7.00IN H20    FURNACE P= 0.20IN H20    COAL P= 4.10IN H20
MILL IN=  491 F   MILL OUT= 151 F   EXIT= 1403 F   EXIT(sp)= 1609 F   SMPL= 1090 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0  6   ELAPSED TIME, MIN   9   RECORD ON TRK   0   FILE   7   REGISTER ADJUSTMENT
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DATE                  :   04-04-84                                     TER DIA        :   8
SYSTEM                :   LWS                                          SPREADER       :   BL CONE
BURNER                :   CCV-100                                      B.P/R.H.       :   0
FUEL                  :   UTAH9                                        OIL CHECK      :   -3.70
-------------------------------------------------------------------------------------------------------------------------------------------------------
                LOAD          PRIM   V-2    V-3    V-4    V-5    V-6    V-7    TOTAL    PRIM  SEC   TER1  TER2  TER3  TER4     PRIM    SEC     TOTAL     O2   CO    CO2   NO    SO2
PT#    TIME   MBTU/HR  TA                        FLOW SCFM                                           FLOW SCFM                        SR (CUM)                          MEASURED
 OIL           CALC   SCFM    \                                                                      TEMP (F)                                                         CORR TO 0% O2
(%)    LOAD    MEAS             \                TEMP (F)                                        VELOCITY (FT/SEC)                                                    CORR TO 3% O2
-------------------------------------------------------------------------------------------------------------------------------------------------------

 746  16:05:29  90.5  16356  2682     70   4450   4449    231   4200   3699   19069    2682 16087    35    35   115   115     0.16    1.21     1.21      3.8  38.0  15.4  280.0  540.0
                                                                                      151   604   733   351   582   439                                 0.0  46.4  18.8  341.9  659.3
   0    0.0    103.6          521    194    605    676    516    664    670              87   113     4     3    11    10                                 3.0  39.8  16.1  293.0  565.1
K-TRON=8400 LBS/HR     REGISTER POSITION=  20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 604 F    WINDBOX P= 9.00IN H20    FURNACE P= 0.25IN H20    COAL P= 5.00IN H20
 MILL IN=  475 F   MILL OUT= 153 F   EXIT= 1404 F   EXIT(sp)= 1500 F   SMPL= 1100 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT 0   7   ELAPSED TIME, MIN   0   RECORD ON TRK   0   FILE   8   REGISTER POSITION

 804  16:37:16  90.7  16304  2734    122   4095   4250    240   4264   3970   19682    2734 16587    61    61   120   120     0.17    1.20     1.20      3.6  35.0  15.2  245.0  570.0
                                                                                      150   599   784   361   566   459                                 0.0  42.2  18.3  295.7  687.9
   0    0.0    103.6          539    195    676    660    517    657    670              89   110     7     5    12    10                                 3.0  36.2  15.7  253.4  589.1
K-TRON=8400 LBS/HR     REGISTER POSITION=  27 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 599 F    WINDBOX P= 7.00IN H20    FURNACE P= 0.20IN H20    COAL P= 5.10IN H20
 MILL IN=  483 F   MILL OUT= 154 F   EXIT= 1397 F   EXIT(sp)= 1591 F   SMPL= 1095 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT 0   8   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE   9   BASELINE

 844  16:55:25  90.0  16270  2739     70   3000   4242    265   4066   3342   18603    2739 15529    35    35   133   133     0.17    1.14     1.14      2.7  35.0  16.2  210.0  590.0
                                                                                      150   605   716   363   632   450                                 0.0  40.2  18.6  241.0  677.0
   0    0.0    103.6          543    198    600    683    525    666    679              89   104     4     3    11    11                                 3.0  34.4  15.9  206.6  580.2
K-TRON=8400 LBS/HR     REGISTER POSITION=  27 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 605 F    WINDBOX P= 7.00IN H20    FURNACE P= 0.20IN H20    COAL P= 5.10IN H20
 MILL IN=  486 F   MILL OUT= 153 F   EXIT= 1417 F   EXIT(sp)= 1510 F   SMPL= 1070 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT 0   9   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  10   EXCESS AIR CURVE
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DATE          :    04-05-84                                          TER DIA       :    8
SYSTEM        :    LWS                                               SPREADER      :    BL CONE
BURNER        :    CCV-100                                           R.P/R.H.      :    29.58/54.0
FUEL          :    UTAH9                                             OIL CHECK     :    -1.89
-------------------------------------------------------------------------------------------------------------------------------------------------
           LOAD         PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL     PRIM   SEC  TER1  TER2  TER3  TER4     PRIM   SEC    TOTAL      O2    CO    CO2    NO     SO2
PT#  TIME  MBTU/HR TA                      FLOW SCFM                                      FLOW SCFM                            SR (CUM)                         MEASURED
 OIL        CALC  SCFM                                                                    TEMP (F)                                                         CORR TO 0% O2
(%)  LOAD   MEAS                           TEMP (F)                                   VELOCITY (FT/SEC)                                                    CORR TO 3% O2
-------------------------------------------------------------------------------------------------------------------------------------------------

219 10:17:41  98.3 16329  2760     0   4655   3873     0   4036   4401   19724     2760 16964    0     0     0     0     0.17   1.21   1.21      3.7  45.0  16.4  250.0  540.0
                                                                                   153   589   896   319   388   410                             0.0  54.6  19.9  303.5  655.5
  0   0.0   101.1         542    184    671    656    509    644    659             90   112     0     0     0     0                             3.0  46.8  17.1  260.1  561.8
K-TRON=0200 LBS/HR    REGISTER POSITION=  25 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 589 F     WINDBOX P=11.00IN H2O   FURNACE P= 0.20IN H2O   COAL P= 4.50IN H2O
MILL IN=  400 F   MILL OUT= 161 F   EXIT= 1416 F   EXIT(so)= 1570 F   SMPL= 1099 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  1   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  11   BASELINE-OPTIMUM

255 10:31:35 101.0 16761  2757     0   4602   4040     0   4168   4343   19909     2757 17153    0     0     0     0     0.16   1.19   1.19      3.4  45.0  16.8  265.0  560.0
                                                                                   154   589   970   350   366   436                             0.0  53.7  20.0  316.2  668.2
  0   0.0   101.1         543    192    666    644    517    642    657             90   113     0     0     0     0                             3.0  46.0  17.2  271.0  572.7
K-TRON=0200 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 589 F     WINDBOX P= 8.50IN H2O   FURNACE P= 0.25IN H2O   COAL P= 4.10IN H2O
MILL IN=  474 F   MILL OUT= 154 F   EXIT= 1413 F   EXIT(so)= 1574 F   SMPL= 1100 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  2   ELAPSED TIME, MIN  8   RECORD ON TRK   0   FILE  12   BASELINE-OPTIMUM

288 10:50:22 101.5 16855  2839     0   4246   3858     0   3920   4008   18870     2839 16031    0     0     0     0     0.17   1.12   1.12      2.3  52.0  17.6  220.0  590.0
                                                                                   153   587   771   344   452   432                             0.0  58.4  19.8  247.1  662.6
  0   0.0   101.1         510    200    669    661    522    643    658             93   105     0     0     0     0                             3.0  50.1  16.9  211.8  567.9
K-TRON=0200 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 587 F     WINDBOX P= 7.50IN H2O   FURNACE P= 0.20IN H2O   COAL P= 4.00IN H2O
MILL IN=  470 F   MILL OUT= 156 F   EXIT= 1449 F   EXIT(so)= 1646 F   SMPL= 1091 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  3   ELAPSED TIME. MIN  7   RECORD ON TRK   0   FILE  13   LOW EXCESS AIR

322 11:04:07  98.2 16311  2735     0   4899   4162     0   4368   4719   20884     2735 18149    0     0     0     0     0.17   1.28   1.28      4.7  40.0  15.2  300.0  500.0
                                                                                   152   584   880   346   456   436                             0.0  51.5  19.6  386.5  644.2
  0   0.0   101.1         546    200    661    627    517    637    651             89   119     0     0     0     0                             3.0  44.2  16.8  331.3  552.1
K-TRON=0200 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 584 F     WINDBOX P=10.00IN H2O   FURNACE P= 0.30IN H2O   COAL P= 5.50IN H2O
MILL IN=  405 F   MILL OUT= 157 F   EXIT= 1403 F   EXIT(so)= 1616 F   SMPL= 1112 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  4   ELAPSED TIME. MIN  7   RECORD ON TRK   0   FILE  14   EXCESS AIR CURVE

351 11:19:31  97.0 16113  2786     0   4890   4436     0   4523   4901   21535     2786 18749    0     0     0     0     0.17   1.34   1.34      5.4  40.0  14.4  330.0  470.0
                                                                                   154   570   984   334   391   422                             0.0  53.8  19.4  444.2  632.7
  0   0.0   101.1         527    195    640    633    501    618    636             91   121     0     0     0     0                             3.0  46.2  16.6  380.8  542.3
K-TRON=0200 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 570 F     WINDBOX P=10.50IN H2O   FURNACE P= 0.25IN H2O   COAL P= 3.40IN H2O
MILL IN=  469 F   MILL OUT= 153 F   EXIT= 1412 F   EXIT(so)= 1610 F   SMPL= 1116 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  5   ELAPSED TIME. MIN  8   RECORD ON TRK   0   FILE  15   MAX. EXCESS AIR

564 13:01:36  98.0 16412  2669     0   4694   3830     0   4147   4483   19824     2669 17156    0     0     0     0     0.16   1.21   1.21      3.7  40.0  16.0  270.0  540.0
                                                                                   153   594 -17968  355   467   442                             0.0  48.6  19.4  327.7  655.5
  0   0.0   101.1         529    198    677    662    510    652    667             87   113     0     0     0     0                             3.0  41.6  16.6  280.9  561.8
K-TRON=0200 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 594 F     WINDBOX P= 9.00IN H2O   FURNACE P= 0.20IN H2O   COAL P= 4.00IN H2O
MILL IN=  472 F   MILL OUT= 152 F   EXIT= 1461 F   EXIT(so)= 1576 F   SMPL= 1126 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  6   ELAPSED TIME. MIN  7   RECORD ON TRK   0   FILE  16   BASELINE

605 13:20:09 102.6 17037  2490     0   4749   4065     0   4359   4686   20349     2490 17059    0     0     0     0     0.15   1.19   1.19      3.5  40.0  16.4  290.0  350.0
                                                                                   152   592 -17968  356   434   444                             0.0  48.0  19.7  348.0  420.0
  0   0.0   101.1         560    200    670    657    521    646    660             81   118     0     0     0     0                             3.0  41.1  16.9  298.3  360.0
K-TRON=0200 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 592 F     WINDBOX P= 9.00IN H2O   FURNACE P= 0.20IN H2O   COAL P= 4.00IN H2O
MILL IN=  504 F   MILL OUT= 152 F   EXIT= 1479 F   EXIT(so)= 1585 F   SMPL= 1166 F   SORBENT= VICRON   MILL INJECTION   SORBENT LBS/HR= 595   SORBENT VELOCITY=  81 FT/SEC   SORBENT AIR FLOW=  237  SCFM  [Ca]/[S]=  3.20
VALID DATA POINT #  7   ELAPSED TIME. MIN  10   RECORD ON TRK   0   FILE  17   LIMESTONE INJECTION
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DATE           :    04-05-84                          TER DIA       :   8
SYSTEM         :    LWS                               SPREADER      :   BL CONE
BURNER         :    CCV-100                           B.P/R.H.      :   29.58/54.0
FUEL           :    UTAH9                             OIL CHECK     :   -1.89
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              LOAD          PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL    PRIM   SEC  TER1  TER2  TER3  TER4     PRIM   SEC    TOTAL       O2    CO    CO2    NO    SO2
PT#    TIME  MBTU/HR  TA                        FLOW SCFM                                     FLOW SCFM                          SR (CUM)                       MEASURED
 OIL          CALC  SCFM                                                                       TEMP (F)                                                      CORR TO 0% O2
(%)  LOAD     MEAS                              TEMP (F)                                 VELOCITY (FT/SEC)                                                   CORR TO 3% O2
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 667 13:50:31  98.5 16357  2522     0   4613'  3975     0   4385   4605  20099    2522 17577     0     0     0     0     0.15   1.23   1.23        4.0  37.0  16.0  300.0  340.0
                                                                                   151   570 -17968   350   436   434                                0.0  45.7  19.8  370.6  420.0
   0    0.0   101.1        543   196    658    647    510    632    649              82   114     0     0     0     0                                3.0  39.2  16.9  317.6  360.0
K-TRON=0200 LBS/HR     REGISTER POSITION=  30 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 578 F     WINDBOX P= 9.00IN H2O    FURNACE P= 0.20IN H2O    COAL P= 4.00IN H2O
MILL IN=  476 F   MILL OUT= 154 F   EXIT= 1405 F   EXIT(sp)= 1350 F   SMPL= 1161 F  SORBENT= VICRON     MILL INJECTION   SORBENT LBS/HR= 397    SORBENT VELOCITY=  82 FT/SEC   SORBENT AIR FLOW=  236  SCFM   (Ca)/(S)=  2.22
VALID DATA POINT #  8   ELAPSED TIME, MIN   0   RECORD ON TRK   0   FILE  18   FILTER BAD

 738 14:26:57  98.2 16311  2703     0   4587   3883     0   4287   4353  19815    2703 17111     0     0     0     0     0.17   1.21   1.21        3.8  45.0  15.8  265.0  530.0
                                                                                   150   564 -17968   344   416   425                                0.0  54.9  19.3  323.5  647.1
   0    0.0   101.1        546   175    670    661    504    641    659              88   112     0     0     0     0                                3.0  47.1  16.5  277.3  554.7
K-TRON=0200 LBS/HR     REGISTER POSITION=  30 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 584 F     WINDBOX P= 9.00IN H2O    FURNACE P= 0.20IN H2O    COAL P= 4.00IN H2O
MILL IN=  479 F   MILL OUT= 152 F   EXIT= 1460 F   EXIT(sp)= 1587 F   SMPL= 1145 F           SORBENT LBS/HR=  0     SORBENT VELOCITY=  88 FT/SEC   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  9   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  19   BASELINE

 763 14:34:27  99.8 16576  2695     0   4554   3857     0   4263   4320  19689    2695 16994     0     0     0     0     0.16   1.19   1.19        3.4  45.0  16.6  260.0  360.0
                                                                                   151   566 -17968   347   472   426                                0.0  53.7  19.8  310.2  429.5
   0    0.0   101.1        524   171    672    662    500    642    661              88   111     0     0     0     0                                3.0  46.0  17.0  265.9  368.2
K-TRON=0200 LBS/HR     REGISTER POSITION=  30 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 586 F     WINDBOX P= 9.00IN H2O    FURNACE P= 0.20IN H2O    COAL P= 4.00IN H2O
MILL IN=  460 F   MILL OUT= 157 F   EXIT= 1476 F   EXIT(sp)= 1615 F   SMPL= 1163 F  SORBENT= VICRON     MILL INJECTION   SORBENT LBS/HR= 397    SORBENT VELOCITY=  88 FT/SEC   SORBENT AIR FLOW=  220  SCFM   (Ca)/(S)=  2.19
VALID DATA POINT #  10   ELAPSED TIME, MIN   9   RECORD ON TRK   0   FILE  20   LIMESTONE

 867 15:27:38 100.0 16600  2740     0   4512   3868     0   4261   4339  19720    2740 16980     0     0     0     0     0.17   1.19   1.19        3.4  40.0  16.4  260.0  560.0
                                                                                   140   593 -17968   346   427   425                                0.0  47.7  19.6  310.2  668.2
   0    0.0   101.1        540   162    680    668    484    653    670              89   112     0     0     0     0                                3.0  40.9  16.8  265.9  572.7
K-TRON=0200 LBS/HR     REGISTER POSITION=  30 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 593 F     WINDBOX P= 9.00IN H2O    FURNACE P= 0.20IN H2O    COAL P= 4.00IN H2O
MILL IN=  477 F   MILL OUT= 153 F   EXIT= 1461 F   EXIT(sp)= 1587 F   SMPL= 1145 F           SORBENT LBS/HR=  0     SORBENT VELOCITY=  87 FT/SEC   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  11   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  21   BASELINE

 881 15:32:03  99.9 16506  2791     0   4498   3857     0   4226   4329  19701    2791 16910     0     0     0     0     0.17   1.19   1.19        3.4  40.0  16.6  260.0  410.0
                                                                                   140   594 -17968   342   482   420                                0.0  47.7  19.8  310.2  489.2
   0    0.0   101.1        504   162    680    668    485    657    671              91   112     0     0     0     0                                3.0  40.9  17.0  265.9  419.3
K-TRON=0200 LBS/HR     REGISTER POSITION=  30 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 594 F     WINDBOX P= 9.00IN H2O    FURNACE P= 0.20IN H2O    COAL P= 4.00IN H2O
MILL IN=  449 F   MILL OUT= 153 F   EXIT= 14[illegible]3 F   EXIT(sp)= 1608 F   SMPL= 1161 F  SORBENT= VICRON     MILL INJECTION   SORBENT LBS/HR= 397    SORBENT VELOCITY=  91 FT/SEC   SORBENT AIR FLOW=  220  SCFM   (Ca)/(S)=  2.19
VALID DATA POINT #  12   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  22   LIMESTONE INJECTION

 911 15:46:38  99.7 16553  2721     0   4518   3840     0   4240   4343  19662    2721 16941     0     0     0     0     0.16   1.19   1.19        3.4  40.0  16.4  260.0  470.0
                                                                                   147   597 -17968   346   413   425                                0.0  47.7  19.6  310.2  560.8
   0    0.0   101.1        536   166    684    671    495    659    674              88   112     0     0     0     0                                3.0  40.9  16.8  265.9  480.7
K-TRON=0200 LBS/HR     REGISTER POSITION=  30 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 597 F     WINDBOX P= 9.00IN H2O    FURNACE P= 0.20IN H2O    COAL P= 4.00IN H2O
MILL IN=  476 F   MILL OUT= 152 F   EXIT= 1404 F   EXIT(sp)= 1596 F   SMPL= 1162 F  SORBENT= VICRON     MILL INJECTION   SORBENT LBS/HR= 198    SORBENT VELOCITY=  88 FT/SEC   SORBENT AIR FLOW=  220  SCFM   (Ca)/(S)=  1.10
VALID DATA POINT #  13   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  23   LIMESTONE INJECTION

 926 15:58:07  98.2 16305  2743     0   4521   3824     0   4248   4359  19695    2743 16952     0     0     0     0     0.17   1.21   1.21        3.7  35.0  15.8  260.0  560.0
                                                                                   148   598 -17968   346   423   430                                0.0  42.5  19.2  315.6  679.8
   0    0.0   101.1        533   169    685    674    500    659    675              89   112     0     0     0     0                                3.0  36.4  16.4  270.5  582.7
K-TRON=0200 LBS/HR     REGISTER POSITION=  30 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 590 F     WINDBOX P= 9.00IN H2O    FURNACE P= 0.20IN H2O    COAL P= 4.00IN H2O
MILL IN=  475 F   MILL OUT= 155 F   EXIT= 1469 F   EXIT(sp)= 1570 F   SMPL= 1142 F           SORBENT LBS/HR=  0     SORBENT VELOCITY=  91 FT/SEC   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  14   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  24   BASELINE
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DATE      :  04-05-84                                      TER DIA    :  8
SYSTEM    :  LWS                                           SPREADER   :  BL. CONE
BURNER    :  CCV-100                                       B.P/R.H.   :  29.58/54.0
FUEL      :  UTAH9                                         OIL CHECK  :  -1.89
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               LOAD        PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL    PRIM   SEC  TER1  TER2  TER3  TER4     PRIM    SEC    TOTAL      O2    CO    CO2    NO    SO2
PT0    TIME  MBTU/HR  TA                          FLOW SCFM                                  FLOW SCFM                              SR (CUM)                          MEASURED
  OIL          CALC  SCFM                                                                    TEMP (F)                                                          CORR TO 0% O2
(I)   LOAD     MEAS                               TEMP (F)                                VELOCITY (FT/SEC)                                                    CORR TO 3% O2
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 951  16:07:49  99.4 16503  2773      0   4536   3881      0   4269   4364   19823    2773 17050     0     0     0     0     0.17    1.20    1.20       3.6  35.0  16.2  275.0  250.0
                                                                                      149   597 -17968  349   456   431                                0.0  42.2  19.6  331.9  301.7
   0    0.0    101.1          526    171    685    673    504    658    674            90   113     0     0     0     0                                3.0  36.2  16.8  284.5  258.6
K-TRON=8200 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 597 F    WINDBOX P= 9.00IN H2O    FURNACE P= 0.20IN H2O    COAL P= 4.00IN H2O
MILL IN=  466 F   MILL OUT= 151 F   EXIT= 1499 F   EXIT(so)= 1557 F   SMPL= 1169 F  SORBENT=DOLOMITE    MILL INJECTION   SORBENT LBS/HR=1095    SORBENT VELOCITY=  90 FT/SEC   SORBENT AIR FLOW=  220  SCFM   [Ca]/[S]=  3.80
VALID DATA POINT 0  15   ELAPSED TIME, MIN   8   RECORD ON TRK   0   FILE  26   DOLOMITE INJECTION

 986  16:23:57  98.2 16299  2735      0   4533   3839      0   4253   4327   19688    2735 16953     0     0     0     0     0.17    1.21    1.21       3.7  35.0  16.0  270.0  300.0
                                                                                      149   599 -17968  356   436   440                                0.0  42.5  19.4  327.7  364.2
   0    0.0    101.1          554    174    684    673    508    660    674            89   112     0     0     0     0                                3.0  36.4  16.6  280.9  312.1
K-TRON=8200 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 599 F    WINDBOX P= 9.00IN H2O    FURNACE P= 0.20IN H2O    COAL P= 4.00IN H2O
MILL IN=  485 F   MILL OUT= 155 F   EXIT= 1480 F   EXIT(so)= 1305 F   SMPL= 1176 F  SORBENT=DOLOMITE    MILL INJECTION   SORBENT LBS/HR= 862    SORBENT VELOCITY=  89 FT/SEC   SORBENT AIR FLOW=  221  SCFM   [Ca]/[S]=  2.99
VALID DATA POINT 0  16   ELAPSED TIME, MIN   9   RECORD ON TRK   0   FILE  27   DOLOMITE INJECTION

1014  16:38:11  98.8 16403  2749      0   4580   3895      0   4259   4331   19814    2749 17065     0     0     0     0     0.17    1.21    1.21       3.7  35.0  15.8  270.0  380.0
                                                                                      150   598 -17968  358   433   447                                0.0  42.5  19.2  327.7  461.3
   0    0.0    101.1          535    178    683    673    513    658    675            89   113     0     0     0     0                                3.0  36.4  16.4  280.9  395.4
K-TRON=8200 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 598 F    WINDBOX P= 9.00IN H2O    FURNACE P= 0.20IN H2O    COAL P= 4.00IN H2O
MILL IN=  484 F   MILL OUT= 151 F   EXIT= 1480 F   EXIT(so)= 1521 F   SMPL= 1164 F  SORBENT=DOLOMITE    MILL INJECTION   SORBENT LBS/HR= 505    SORBENT VELOCITY=  89 FT/SEC   SORBENT AIR FLOW=  220  SCFM   [Ca]/[S]=  1.75
VALID DATA POINT 0  17   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  28   DOLOMITE INJECTION
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DATE          :   04-06-84                          TER DIA      :   8
SYSTEM        :   LWS                               SPREADER     :   BL CONE
BURNER        :   CCV-100                           B.P/R.H.     :   29.36/70.0
FUEL          :   ILLINOIS2                         OIL CHECK    :   -2.47
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              LOAD         PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL    PRIM   SEC  TER1  TER2  TER3  TER4    PRIM    SEC    TOTAL     02    CO    CO2    NO    SO2
PT0    TIME  MBTU/HR  TA                        FLOW SCFM                                     FLOW SCFM                           SR (CUM)                          MEASURED
  OIL         CALC  SCFM                                                                        TEMP (F)                                                         CORR TO 0% 02
(%)   LOAD    MEAS                              TEMP (F)                                     VELOCITY (FT/SEC)                                                   CORR TO 3% 02
----------------------------------------------------------------------------------------------------------------------------------------

 323  11:30:07  102.4 17291  2603      0   4813   4150      0   4538   4801   20986     2603 18302     0     0     0     0     0.15    1.21    1.21      3.7  40.0  16.2  335.0 2620.0
                                                                                     142   578  1096   355   370   437                              0.0  48.6  19.7  406.6 3180.3
   0    0.0    99.4        736    179    655    646    506    627    645               84   119     0     0     0     0                              3.0  41.6  16.9  348.6 2726.1
K-TRON=9000 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 578 F    WINDBOX P= 8.60IN H2O   FURNACE P= 0.35IN H2O   COAL P= 4.80IN H2O
MILL IN=  640 F   MILL OUT= 139 F   EXIT= 1440 F   EXIT(sp)= 1593 F   SMPL= 1118 F        SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0   1   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  30   BASELINE

 340  11:45:46  102.0 17357  2490      0   4715   4075      0   4547   4693   20520     2490 18030     0     0     0     0     0.14    1.18    1.18      3.3  40.0  16.2  335.0 2560.0
                                                                                     143   573  1112   357   391   435                              0.0  47.5  19.2  397.5 3037.3
   0    0.0    99.4        742    174    652    642    502    626    642               80   117     0     0     0     0                              3.0  40.7  16.5  340.7 2603.4
K-TRON=9000 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 573 F    WINDBOX P= 8.60IN H2O   FURNACE P= 0.35IN H2O   COAL P= 4.80IN H2O
MILL IN=  653 F   MILL OUT= 131 F   EXIT= 1477 F   EXIT(sp)= 1635 F   SMPL= 1129 F        SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0   2   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  31   BASELINE

 375  12:01:34  103.1 17395  2523      0   4961   4391      0   4674   4724   21273     2523 18750     0     0     0     0     0.15    1.22    1.22      3.9  38.0  15.6  430.0 2360.0
                                                                                     144   568  1075   374   460   407                              0.0  46.7  19.2  528.1 2898.2
   0    0.0    99.4        742    173    645    635    501    623    636               81   121     0     0     0     0                              3.0  40.0  16.4  452.6 2484.P
K-TRON=9000 LBS/HR    REGISTER POSITION=  35 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 568 F    WINDBOX P= 8.60IN H2O   FURNACE P= 0.35IN H2O   COAL P= 4.80IN H2O
MILL IN=  653 F   MILL OUT= 134 F   EXIT= 1358 F   EXIT(sp)= 1507 F   SMPL= 1149 F        SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0   3   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  32   REGISTER OPENING

 410  12:19:33  102.4 17207  2619      0   4204   4140      0   4404   4879   20376     2619 17706     0     0     0     0     0.15    1.18    1.18      3.2  45.0  16.2  315.0 2860.0
                                                                                     144   576  1058   337   392   409                              0.0  53.1  19.1  371.6 3374.2
   0    0.0    96.4        737    169    654    645    503    620    644               84   115     0     0     0     0                              3.0  45.5  16.4  318.5 2892.1
K-TRON=9500 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 576 F    WINDBOX P=10.50IN H2O   FURNACE P= 0.25IN H2O   COAL P= 4.30IN H2O
MILL IN=  646 F   MILL OUT= 143 F   EXIT= 1401 F   EXIT(sp)= 1624 F   SMPL= 1142 F        SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0   4   ELAPSED TIME, MIN   0   RECORD ON TRK   0   FILE  33   REGISTER POSITION CHANGE

 455  12:42:02  101.4 17117  2672      0   4174   4327      0   4560   4846   20570     2672 17907     0     0     0     0     0.16    1.20    1.20      3.6  40.0  16.2  330.0 2920.0
                                                                                     143   568  1098   339   382   409                              0.0  48.3  19.6  398.3 3524.1
   0    0.0    96.4        717    160    642    634    483    617    634               86   115     0     0     0     0                              3.0  41.4  16.8  341.4 3020.T
K-TRON=9500 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 568 F    WINDBOX P= 9.50IN H2O   FURNACE P= 0.25IN H2O   COAL P= 4.60IN H2O
MILL IN=  630 F   MILL OUT= 142 F   EXIT= 1477 F   EXIT(sp)= 1622 F   SMPL= 1130 F        SORBENT LBS/HR=  0     SURBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0   5   ELAPSED TIME, MIN   0   RECORD ON TRK   0   FILE  34   BASFLINE-EXCESS AIR CURVE

 505  13:10:52  100.5 16956  2746      0   3677   3940      0   4257   4275   18696     2746 16149     0     0     0     0     0.16    1.11    1.11      2.2  57.0  17.4  275.0 3160.0
                                                                                     143   574  1039   338   403   398                              0.0  63.7  19.4  307.2 3529.0
   0    0.0    96.4        714    154    653    644    471    630    647               88   105     0     0     0     0                              3.0  54.6  16.7  263.3 3025.5
K-TRON=9500 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 574 F    WINDBOX P= 8.00IN H2O   FURNACE P= 0.25IN H2O   COAL P= 4.40IN H2O
MILL IN=  627 F   MILL OUT= 142 F   EXIT= 1400 F   EXIT(sp)=  646 F   SMPL= 1126 F        SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SURBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0   6   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  35   MIN. EXCESS AIR

 560  13:36:29  101.0 17041  2681      0   4535   4475      0   4514   5126   21331     2681 18650     0     0     0     0     0.16    1.25    1.25      4.3  45.0  15.2  375.0 2400.0
                                                                                     145   560  1102   336   415   402                              0.0  56.6  19.1  471.6 3010.0
   0    0.0    96.4        710    150    634    626    450    608    630               87   119     0     0     0     0                              3.0  40.5  16.4  404.2 2586.0
K-TRON=9500 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 560 F    WINDBOX P=10.50IN H2O   FURNACE P= 0.30IN H2O   COAL P= 5.00IN H2O
MILL IN=  633 F   MILL OUT= 140 F   EXIT= 1490 F   EXIT(sp)=  670 F   SMPL= 1163 F        SORFENT LBS/HR=  0     SURBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0 SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0   7   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  36   EXCESS AIR CURVE
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DATE              :   4/6/84                          TER DIA         :   8
SYSTEM            :   LWS                             SPREADER        :   BL CONE
BURNER            :   CCV-100                         R.P/R.H.        :   29.36/70.0
FUEL              :   ILLINOIS2                       OIL CHECK       :   -2.47

          LOAD         PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL    PRIM  SEC  TER1  TER2  TER3  TER4     PRIM    SEC     TOTAL        O2    CO    CO2    NO    SO2
PT#  TIME  MBTU/HR  TA                        FLOW SCFM                                     FLOW SCFM                          SR (CUM)                              MEASURED
 OIL        CALC  SCFM                                                                      TEMP (F)                                                            CORR TO 0% O2
(%)  LOAD   MEAS                              TEMP (F)                               VELOCITY (FT/SEC)                                                          CORR TO 3% O2

 593 13:58:54 100.3 16923  2675      0   4814   4982      0   4495   5127   22093     2675 19410    0     0     0     0     0.16    1.31    1.31        5.0   35.0  14.6  390.0 2120.0
                                                                                     146   557  1110   323   416   393                                  0.0   45.9  19.2  511.9 2782.5
   0    0.0   83.2          724    144    631    622    440    603    627             87   124    0     0     0     0                                  3.0   39.4  16.4  438.8 2385.1
K-TRON=6200 LBS/HR   REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 557 F   WINDBOX P=11.30IN H2O   FURNACE P= 0.25IN H2O   COAL P= 6.00IN H2O
MILL IN=  639 F  MILL OUT= 144 F  EXIT= 1475 F  EXIT(sp)=  690 F  SMPL= 1160 F        SORBENT LBS/HR=  0   SORBENT VELOCITY=  0 FT/SEC  SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  8  ELAPSED TIME, MIN  6  RECORD ON TRK  0  FILE 42  MAX. EXCESS AIR

 678 14:28:14 103.4 17440  2656      0   4359   4527      0   4381   5053   20977     2656 18320    0     0     0     0     0.15    1.20    1.20        3.6   40.0  16.0  280.0 2160.0
                                                                                     147   564  1001   330   446   391                                  0.0   48.3  19.3  337.9 2606.9
   0    0.0   83.2          722    139    637    629    445    612    633             86   117    0     0     0     0                                  3.0   41.4  16.6  289.7 2234.5
K-TRON=6200 LBS/HR   REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 564 F   WINDBOX P=10.00IN H2O   FURNACE P= 0.25IN H2O   COAL P= 4.70IN H2O
MILL IN=  639 F  MILL OUT= 145 F  EXIT= 1487 F  EXIT(sp)=  877 F  SMPL= 1165 F        SORBENT LBS/HR=  0   SORBENT VELOCITY=  0 FT/SEC  SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  9  ELAPSED TIME, MIN  10  RECORD ON TRK  1  FILE  1  BASELINE

 736 15:05:10 101.1 17060  2452      0   4262   4400      0   4285   5006   20405     2452 17953    0     0     0     0     0.14    1.20    1.20        3.5   40.0  16.4  270.0 1520.0
                                                                                     145   562  1120   335   431   404                                  0.0   48.0  19.7  324.0 1824.0
   0    0.0   83.2          751    134    638    631    445    612    633             79   115    0     0     0     0                                  3.0   41.1  16.9  277.7 1563.4
K-TRON=6200 LBS/HR   REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 562 F   WINDBOX P=10.00IN H2O   FURNACE P= 0.25IN H2O   COAL P= 4.70IN H2O
MILL IN=  661 F  MILL OUT= 147 F  EXIT= 1523 F  EXIT(sp)= 1431 F  SMPL= 1197 F  SORBENT= VICRON   MILL INJECTION   SORBENT LBS/HR= 900   SORBENT VELOCITY=  79 FT/SEC   SORBENT AIR FLOW=  222  SCFM  [Ca]/[S]= 1.37
VALID DATA POINT #  10  ELAPSED TIME, MIN  15  RECORD ON TRK  0  FILE 83  LIMESTONE INJECTION

   6 15:27:32 103.0 17390  2441      0   4313   4389      0   4275   5141   20559     2441 18110    0     0     0     0     0.14    1.18    1.18        3.3   40.0  16.2  270.0 2100.0
                                                                                     147   560  1117   326   459   386                                  0.0   47.5  19.2  320.3 2491.5
   0    0.0   94.3          748    131    635    629    443    611    634             79   116    0     0     0     0                                  3.0   40.7  16.5  274.6 2135.6
K-TRON=9300 LBS/HR   REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 560 F   WINDBOX P=10.00IN H2O   FURNACE P= 0.20IN H2O   COAL P= 4.80IN H2O
MILL IN=  654 F  MILL OUT= 147 F  EXIT= 1504 F  EXIT(sp)=  999 F  SMPL= 1186 F        SORBENT LBS/HR=  0   SORBENT VELOCITY=  0 FT/SEC  SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  11  ELAPSED TIME, MIN  10  RECORD ON TRK  1  FILE  2  BASELINE

  52 15:44:45  99.9 16861  2448      0   4360   4375      0   4268   5169   20620     2448 18172    0     0     0     0     0.15    1.22    1.22        3.9   40.0  15.6  345.0 2120.0
                                                                                     146   560  1134   323   415   387                                  0.0   49.1  19.2  423.7 2603.5
   0    0.0   94.3          764    130    638    628    438    610    632             79   116    0     0     0     0                                  3.0   42.1  16.4  363.2 2231.6
K-TRON=9300 LBS/HR   REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 560 F   WINDBOX P=10.00IN H2O   FURNACE P= 0.20IN H2O   COAL P= 4.80IN H2O
MILL IN=  669 F  MILL OUT= 143 F  EXIT= 1475 F  EXIT(sp)= 1636 F  SMPL= 1171 F        SORBENT LBS/HR=  0   SORBENT VELOCITY=  0 FT/SEC  SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  12  ELAPSED TIME, MIN  10  RECORD ON TRK  1  FILE  3  BASELINE-METHOD 7
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DATE              :     04-09-84                          TER DIA          :    8
SYSTEM            :     LWS                               SPREADER         :    BL CONE
BURNER            :     CCV-100                           B.P/R.H.         :    29.58/54.0
FUEL              :     ILLINOIS2                         OIL CHECK        :    -3.15

              LOAD         PRIM   V -2   V -3   V -4   V -5   V -6   V -7   TOTAL     PRIM   SEC  TER1  TER2  TER3  TER4     PRIM    SEC    TOTAL       O2    CO    CO2    NO    SO2
PT#    TIME  MBTU/HR  TA                        FLOW SCFM                                         FLOW SCFM                        SR (CUM)                               MEASURED
 OIL          CALC  SCFM                                                                           TEMP (F)                                                         CORR TO 0% O2
(%)   LOAD    MEAS                              TEMP (F)                                        VELOCITY (FT/SEC)                                                  CORR TO 3% O2

 359  11:15:13  98.3 16592  2433      0   4143   4249      0   4199   4811   19836     2433 17403     0     0     0     0     0.15   1.20    1.20        3.5   45.0   17.0  325.0 2420.0
                                                                                        147   581  1055   331   421   415                                  0.0   54.0   20.4  390.0 2904.0
   0    0.0     96.4          755    168    657    650    400    633    650             79   114     0     0     0     0                                  3.0   46.3   17.5  334.3 2489.1
K-TRON=9500 LBS/HR    REGISTER POSITION=   30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 501 F     WINDBOX P=10.00IN H20    FURNACE P= 0.25IN H20    COAL P= 5.20IN H20
MILL IN=  672 F   MILL OUT= 146 F   EXIT= 1479 F   EXIT(so)=  400 F   SMPL= 1144 F            SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #   1   ELAPSED TIME, MIN   8   RECORD ON TRK   0   FILE  42   BASELINE

 433  11:51:26 100.1 16894  2337      0   4237   4334      0   4166   5011   20085     2337 17747     0     0     0     0     0.14   1.19    1.19        3.4   40.0   16.0  325.0 2420.0
                                                                                        146   560  1052   316   439   403                                  0.0   47.7   20.0  387.0 2907.5
   0    0.0     96.4          760    153    644    630    465    620    639             76   114     0     0     0     0                                  3.0   40.9   17.2  332.4 2454.5
K-TRON=9500 LBS/HR    REGISTER POSITION=   30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 560 F     WINDBOX P=10.00IN H20    FURNACE P= 0.25IN H20    COAL P= 5.20IN H20
MILL IN=  686 F   MILL OUT= 145 F   EXIT= 1495 F   EXIT(so)=  955 F   SMPL= 1175 F            SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #   2   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  43   BASELINE

 447  12:01:33  97.0 16370  2367      0   4205   4383      0   4197   4983   20135     2367 17760     0     0     0     0     0.14   1.23    1.23        4.0   38.0   16.6  355.0 1680.0
                                                                                        147   569  1106   315   385   412                                  0.0   46.9   20.5  438.5 2076.3
   0    0.0     96.4          764    149    643    634    465    622    638             77   115     0     0     0     0                                  3.0   40.2   17.6  375.9 1842.0
K-TRON=9500 LBS/HR    REGISTER POSITION=   30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 569 F     WINDBOX P=10.00IN H20    FURNACE P= 0.25IN H20    COAL P= 5.20IN H20
MILL IN=  677 F   MILL OUT= 145 F   EXIT= 1510 F   EXIT(so)=  942 F   SMPL= 1180 F  SORBENT= VICRON      MILL INJECTION    SORBENT LBS/HR=1691    SORBENT VELOCITY=  77 FT/SEC   SORBENT AIR FLOW=  225  SCFM   [Ca]/[S]=  2.22
VALID DATA POINT #   3   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  44   LIMESTONE INJECTION

 456  12:12:07  98.6 16634  2412      0   4160   4336      0   4159   4931   19999     2412 17566     0     0     0     0     0.15   1.20    1.20        3.6   40.0   16.4  330.0 2520.0
                                                                                        144   560  1082   319   421   406                                  0.0   48.3   19.0  398.3 3041.4
   0    0.0     96.4          757    149    641    635    464    619    637             78   113     0     0     0     0                                  3.0   41.4   17.0  341.4 2606.9
K-TRON=9500 LBS/HR    REGISTER POSITION=   30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 568 F     WINDBOX P=10.00IN H20    FURNACE P= 0.25IN H20    COAL P= 5.20IN H20
MILL IN=  669 F   MILL OUT= 146 F   EXIT= 1490 F   EXIT(so)=  949 F   SMPL= 1166 F            SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #   4   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  45   BASELINE

 475  12:18:05  99.3 16756  2447      0   4175   4311      0   4217   4994   20145     2447 17697     0     0     0     0     0.15   1.20    1.20        3.6   40.0   16.8  340.0 1920.0
                                                                                        146   567  1108   312   416   407                                  0.0   48.3   20.3  410.3 2317.2
   0    0.0     96.4          752    147    642    634    468    616    637             79   114     0     0     0     0                                  3.0   41.4   17.4  351.7 1986.2
K-TRON=9500 LBS/HR    REGISTER POSITION=   30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 567 F     WINDBOX P=10.00IN H20    FURNACE P= 0.25IN H20    COAL P= 5.20IN H20
MILL IN=  668 F   MILL OUT= 146 F   EXIT= 1530 F   EXIT(so)= 1572 F   SMPL= 1194 F  SORBENT= VICRON      MILL INJECTION    SORBENT LBS/HR=1173    SORBENT VELOCITY=  79 FT/SEC   SORBENT AIR FLOW=  220  SCFM   [Ca]/[S]=  1.44
VALID DATA POINT #   5   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  46   LIMESTONE INJECTION

 491  12:35:20  97.5 16453  2304      0   4162   4302      0   4161   4964   19893     2304 17589     0     0     0     0     0.14   1.21    1.21        3.7   40.0   16.4  325.0 2560.0
                                                                                        143   569  1066   309   445   401                                  0.0   48.6   19.9  394.5 3107.5
   0    0.0     96.4          760    145    645    637    466    623    642             74   113     0     0     0     0                                  3.0   41.6   17.1  338.2 2663.6
K-TRON=9500 LBS/HR    REGISTER POSITION=   30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 569 F     WINDBOX P=10.00IN H20    FURNACE P= 0.25IN H20    COAL P= 5.20IN H20
MILL IN=  670 F   MILL OUT= 145 F   EXIT= 1526 F   EXIT(so)= 1546 F   SMPL= 1180 F            SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #   6   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  47   BASELINE

 512  12:46:44  99.5 16790  2409      0   4112   4363      0   4198   4887   19970     2409 17560     0     0     0     0     0.14   1.19    1.19        3.4   40.0   16.0  330.0 2120.0
                                                                                        145   571  1090   317   427   408                                  0.0   47.7   20.0  393.7 2529.5
   0    0.0     96.4          762    143    647    641    467    623    645             78   113     0     0     0     0                                  3.0   40.9   17.2  337.5 2168.2
K-TRON=9500 LBS/HR    REGISTER POSITION=   30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 571 F     WINDBOX P=10.00IN H20    FURNACE P= 0.25IN H20    COAL P= 5.20IN H20
MILL IN=  677 F   MILL OUT= 146 F   EXIT= 1547 F   EXIT(so)= 1557 F   SMPL= 1197 F  SORBENT= VICRON      MILL INJECTION    SORBENT LBS/HR= 615    SORBENT VELOCITY=  78 FT/SEC   SORBENT AIR FLOW=  225  SCFM   [Ca]/[S]= 0.80
VALID DATA POINT #   7   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  40   LIMESTONE INJECTION
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DATE                 :     04-09-84                              TER DIA          :   8
SYSTEM               :     LWS                                   SPREADER         :   BL CONE
BURNER               :     CCV-100                               B.P/R.H.         :   29.58/54.0
FUEL                 :     ILLINOIS2                             OIL CHECK        :   -3.15
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              LOAD          PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL     PRIM   SEC  TER1  TER2  TER3  TER4     PRIM   SEC    TOTAL        O2    CO  · CO2    NO    SO2
PT#   TIME  MBTU/HR  TA                          FLOW SCFM                                         FLOW SCFM                         SR (CUM)                         MEASURED
 OIL         CALC   SCFM                                                                            TEMP (F)                                                       CORR TO 0% O2
(%)   LOAD   MEAS                                TEMP (F)                                      VELOCITY (FT/SEC)                                                   CORR TO 3% O2
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 529  13:00:45  97.4 16439  2616      0   4135   4344      0   4209   4917   20221     2616 17605     0     0     0     0     0.16    1.23    1.23       4.0   40.0  16.2  340.0 2560.0
                                                                                      147   568  1098   322   431   400                                  0.0   49.4  20.0  420.0 3162.4
   0    0.0     96.4         736    140    644    636    459    618    641             85   113     0     0     0     0                                  3.0   42.4  17.2  360.0 2710.6
K-TRON=9500 LBS/HR    REGISTER POSITION=   30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 560 F      WINDBOX P=10.00IN H2O    FURNACE P= 0.25IN H2O    COAL P= 5.20IN H2O
MILL IN=  656 F   MILL OUT= 146 F   EXIT= 1489 F   EXIT(sp)= 1487 F   SMPL= 1177 F          SORBENT LBS/HR=   0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=,   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #   8   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  49   BASELINE

 613  13:37:21  79.0 13333  2399      0   3250   3347      0   3370   3654   16029     2399 13630     0     0     0     0     0.10    1.20    1.20       3.6   45.0  16.4  260.0 2700.0
                                                                                      152   597   946   284   424   374                                  0.0   54.3  19.8  313.8 3258.6
   0    0.0     77.1         760    135    694    603    459    661    609             78    90     0     0     0     0                                  3.0   46.6  17.0  269.0 2793.1
K-TRON=7600 LBS/HR    REGISTER POSITION=   30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 597 F      WINDBOX P= 7.00IN H2O    FURNACE P= 0.25IN H2O    COAL P= 4.40IN H2O
MILL IN=  675 F   MILL OUT= 154 F   EXIT= 1420 F   EXIT(sp)= 1415 F   SMPL= 1087 F          SORBENT LBS/HR=   0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #   9   ELAPSED TIME, MIN   8   RECORD ON TRK   0   FILE  50   REDUCED LOAD

 736  14:35:56  57.0  9615  2567      0   2243   2421      0   2570   2667   12476     2567  9989     0     0     0     0     0.27    1.30    1.30       4.9   60.0  14.8  150.0 2060.0
                                                                                      153   562   830   235   393   301                                  0.0   70.3  19.3  195.7 2687.0
   0    0.0     50.7         515    119    660    653    409    633    650             84    63     0     0     0     0                                  3.0   67.1  16.5  167.7 2303.1
K-TRON=5000 LBS/HR    REGISTER POSITION=   20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 562 F      WINDBOX P= 3.00IN H2O    FURNACE P= 0.01IN H2O    COAL P= 2.40IN H2O
MILL IN=  464 F   MILL OUT= 157 F   EXIT= 1249 F   EXIT(sp)= 1251 F   SMPL=  934 F          SORBENT LBS/HR=   0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  10   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  51   EXCESS AIR CURVE

 753  14:45:25  56.1  9473  2560      0   2062   2310      0   2440   2547   11920     2560  9360     0     0     0     0     0.27    1.26    1.26       4.4   65.0  15.4  150.0 2120.0
                                                                                      154   554   592   230   537   298                                  0.0   82.2  19.5  189.8 2681.9
   0    0.0     50.7         505    119    650    644    403    623    651             84    59     0     0     0     0                                  3.0   70.5  16.7  162.7 2290.0
K-TRON=5000 LBS/HR    REGISTER POSITION=   20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 554 F      WINDBOX P= 3.00IN H2O    FURNACE P= 0.01IN H2O    COAL P= 2.40IN H2O
MILL IN=  452 F   MILL OUT= 157 F   EXIT= 1258 F   EXIT(sp)= 1254 F.  SMPL=  920 F          SORBENT LBS/HR=   0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  11   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  52   EXCESS AIR CURVE

 791  15:07:44  56.6  9547  2636      0   1922   2296      0   2273   2351   11470     2636  8042     0     0     0     0     0.20    1.20    1.20       3.6   90.0  16.0  130.0 2200.0
                                                                                      153   544   639   233   398   295                                  0.0  108.6  19.3  156.9 2655.2
   0    0.0     50.7         537    118    643    638    405    618    645             86    56     0     0     0     0                                  3.0   93.1  16.6  134.5 2275.9
K-TRON=5000 LBS/HR    REGISTER POSITION=   20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 544 F      WINDBOX P= 3.00IN H2O    FURNACE P= 0.01IN H2O    COAL P= 2.40IN H2O
MILL IN=  479 F   MILL OUT= 156 F   EXIT= 1247 F   EXIT(sp)= 1133 F   SMPL=  921 F          SORBENT LBS/HR=   0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  12   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  53   EXCESS AIR CURVE

 830  15:29:59  59.5 10030  2575      0   2240   2252      0   2269   2524   11067     2575  9292     0     0     0     0     0.26    1.10    1.10       3.3   85.0  16.8  145.0 1260.0
                                                                                      152   542   450   232   625   290                                  0.0  100.0  19.9  172.0 1494.9
   0    0.0     50.7         533    116    643    636    399    613    643             84    58     0     0     0     0                                  3.0   86.4  17.1  147.5 1281.4
K-TRON=5000 LBS/HR    REGISTER POSITION=   20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 542 F      WINDBOX P= 3.00IN H2O    FURNACE P= 0.01IN H2O    COAL P= 2.40IN H2O
MILL IN=  473 F   MILL OUT= 159 F   EXIT= 1316 F   EXIT(so)= 1321 F   SMPL=  985 F  SORBENT= VICRON     MILL INJECTION    SORBENT LBS/HR= 965    SORBENT VELOCITY=  84 FT/SEC   SORBENT AIR FLOW=  220  SCFM   [Ca]/[S]= 2.41
VALID DATA POINT #  13   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  54   LIMESTONE INJECTION

 842  15:40:06  57.3  9664  2563      0   2276   2292      0   2275   2550   11956     2563  9393     0     0     0     0     0.27    1.24    1.24       4.1   80.0  15.6  150.0 2160.0
                                                                                      151   540   410   237   834   301                                  0.0   99.4  19.4  186.4 2684.0
   0    0.0     50.7         551    114    640    632    396    611    640             84    59     0     0     0     0                                  3.0   85.2  16.6  159.0 2300.6
K-TRON=5000 LBS/HR    REGISTER POSITION=   20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 540 F      WINDBOX P= 3.00IN H2O    FURNACE P= 0.01IN H2O    COAL P= 2.40IN H2O
MILL IN=  500 F   MILL OUT= 156 F   EXIT= 1262 F   EXIT(so)= 1272 F   SMPL=  950 F          SORBENT LBS/HR=   0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  14   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  55   BASELINE
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DATE           :    04-09-84                                   TER DIA        :    8
SYSTEM         :    LWS                                        SPREADER       :    BL CONE
BURNER         :    CCV-100                                    B.P/R.H.       :    29.58/54.0
FUEL           :    ILLINOIS2                                  OIL CHECK      :    -3.15
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              LOAD          PRIM    V -2    V -3    V -4    V -5    V -8    V -7    TOTAL      PRIM   SEC   TER1   TER2   TER3   TER4      PRIM    SEC     TOTAL       O2    CO    CO2    NO    SO2
PT#    TIME  MBTU/HR TA                                FLOW SCFM                                          FLOW SCFM                               SR (CUM)                       MEASURED
  OIL          CALC  SCFM                                                                                  TEMP (F)                                                          CORR TO 0% O2
(%)    LOAD    MEAS                                    TEMP (F)                                        VELOCITY (FT/SEC)                                                     CORR TO 3% O2
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 992  16:56:06   59.3 10011  2515      0    2003    2334      0    2416    2503   11771       2515  9256      0      0      0      0      0.25    1.10    1.10        3.2   80.0  16.4  130.0 2160.0
                                                                                             153   631    631    241    433    307                                  0.0   94.4  19.3  153.4 2548.3
   0     0.0     50.7         548     122     754     747     439     719     746               82    63      0      0      0      0                                  3.0   80.9  16.6  131.5 2184.1
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 631 F      WINDBOX P= 3.00IN H20    FURNACE P= 0.01IN H20    COAL P= 2.40IN H20
MILL IN=  493 F   MILL OUT= 157 F   EXIT= 1299 F   EXIT(so)= 1252 F   SMPL=  961 F              SORBENT LBS/HR=   0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  15   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  56   BASELINE

 999  17:01:01   56.0  9595  2307      0    2013    2357      0    2425    2498   11601       2307  9293      0      0      0      0      0.24    1.21    1.21        3.7   75.0  16.0  150.0 1420.0
                                                                                             151   651    516    245    500    312                                  0.0   91.0  19.4  182.1 1723.7
   0     0.0     50.7         589     122     779     773     440     742     773               75    65      0      0      0      0                                  3.0   78.0  16.6  156.1 1477.5
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 651 F      WINDBOX P= 3.00IN H20    FURNACE P= 0.01IN H20    COAL P= 2.40IN H20
MILL IN=  521 F   MILL OUT= 156 F   EXIT= 1303 F   EXIT(so)= 1336 F   SMPL=  980 F  SORBENT= VICRON      MILL INJECTION    SORBENT LBS/HR= 645    SORBENT VELOCITY=  75 FT/SEC   SORBENT AIR FLOW=  220  SCFM   [Ca]/[S]= 1.61
VALID DATA POINT #  16   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  57   LIMESTONE INJECTION

1021  17:13:38   57.6  9720  2755      0    2013    2341      0    2400    2447   11956       2755  9201      0      0      0      0      0.28    1.23    1.23        4.0   65.0  15.8  180.0 1640.0
                                                                                             151   683    447    254    723    326                                  0.0   80.3  19.5  222.4 2025.9
   0     0.0     50.7         536     122     824     815     478     785     817               90    66      0      0      0      0                                  3.0   68.8  16.7  190.6 1736.5
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 683 F      WINDBOX P= 3.00IN H20    FURNACE P= 0.01IN H20    COAL P= 2.40IN H20
MILL IN=  490 F   MILL OUT= 159 F   EXIT= 1306 F   EXIT(so)= 1284 F   SMPL=  905 F  SORBENT= VICRON      MILL INJECTION    SORBENT LBS/HR= 377    SORBENT VELOCITY=  90 FT/SEC   SORBENT AIR FLOW=  220  SCFM   [Ca]/[S]=  0.94
VALID DATA POINT #  17   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  58   LIMESTONE INJECTION

1033  17:21:14   56.3  9504  2693      0    2017    2271      0    2369    2400   11750       2693  9065      0      0      0      0      0.28    1.24    1.24        4.1   65.0  15.4  180.0 2060.0
                                                                                             152   701    362    264    875    339                                  0.0   80.8  19.1  223.7 2559.8
   0     0.0     50.7         535     126     845     836     490     804     838               80    66      0      0      0      0                                  3.0   69.2  16.4  191.7 2194.1
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 701 F      WINDBOX P= 3.00IN H20    FURNACE P= 0.01IN H20    COAL P= 2.40IN H20
MILL IN=  478 F   MILL OUT= 160 F   EXIT= 1283 F   EXIT(so)= 1318 F   SMPL=  973 F              SORBENT LBS/HR=   0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  18   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  59   BASELINE
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DATE        :   04-09-84                          TER DIA       :   8
SYSTEM      :   LWS                               SPREADER      :   BL. CONE
BURNER      :   CCV-100                           R.P/R.H.      :   29.58/54.0
FUEL        :   UTAH9                             OIL CHECK     :   -3.15
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              LOAD       PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL    PRIM  SEC  TER1  TER2  TER3  TER4    PRIM    SEC    TOTAL      O2    CO    CO2    NO    SO2
PT#   TIME  MBTU/HR  TA                      FLOW SCFM                                         FLOW SCFM                       SR (CUM)                         MEASURED
  OIL         CALC  SCFM                                                                       TEMP (F)                                                    CORR TO 0% O2
(%)   LOAD    MEAS                           TEMP (F)                                     VELOCITY (FT/SEC)                                                CORR TO 3% O2
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1121  10:00:55  58.5  9705  2496      0   2069   2083      0   2107   2566  11402    2496  8906     0     0     0     0    0.26    1.17    1.17      3.2   85.0  16.0  130.0  580.0
                                                                                     152   612   673   258   560   332                              0.0  100.3  18.9  153.4  604.3
   0    0.0   61.7         441    130    726    720    482    695    723             81    60     0     0     0     0                              3.0   86.0  16.2  131.5  586.5
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 612 F    WINDBOX P= 3.00IN H2O    FURNACE P= 0.01IN H2O    COAL P= 2.40IN H2O
MILL IN=  391 F   MILL OUT= 156 F   EXIT= 1262 F   EXIT(sp)= 1290 F   SMPL=  947 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  19   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  60   BASELINE

1133  10:09:07  56.6  9404  2524      0   2124   2161      0   2235   2646  11690    2524  9165     0     0     0     0    0.27    1.24    1.24      4.2   60.0  15.2  140.0  290.0
                                                                                     152   600   542   254   661   328                              0.0   75.0  19.0  175.0  362.5
   0    0.0   61.7         469    120    710    703    475    679    706             82    61     0     0     0     0                              3.0   64.3  16.3  150.0  310.7
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 600 F    WINDBOX P= 2.50IN H2O    FURNACE P= 0.01IN H2O    COAL P= 2.70IN H2O
MILL IN=  415 F   MILL OUT= 157 F   EXIT= 1270 F   EXIT(sp)= 1317 F   SMPL=  961 F  SORBENT= VICRON    MILL INJECTION    SORBENT LBS/HR= 337    SORBENT VELOCITY=  82 FT/SEC   SORBENT AIR FLOW=  220  SCFM   (Ca)/(S)=  3.20
VALID DATA POINT #  20   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  61   LIMESTONE INJECTION

1152  10:18:34  57.1  9407  2519      0   2110   2170      0   2240   2610  11657    2519  9138     0     0     0     0    0.27    1.23    1.23      4.0   60.0  15.2  140.0  320.0
                                                                                     152   590   500   255   687   329                              0.0   74.1  18.8  172.9  395.3
   0    0.0   61.7         438    129    695    689    470    665    692             82    60     0     0     0     0                              3.0   63.5  16.1  148.2  338.8
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 590 F    WINDBOX P= 2.50IN H2O    FURNACE P= 0.01IN H2O    COAL P= 2.70IN H2O
MILL IN=  383 F   MILL OUT= 157 F   EXIT= 1281 F   EXIT(sp)= 1323 F   SMPL=  956 F  SORBENT= VICRON    MILL INJECTION    SORBENT LBS/HR= 234    SORBENT VELOCITY=  82 FT/SEC   SORBENT AIR FLOW=  220  SCFM   (Ca)/(S)=  2.26
VALID DATA POINT #  21   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  62   LIMESTONE INJECTION

1166  10:32:23  58.9  9783  2494      0   2110   2147      0   2237   2625  11621    2494  9127     0     0     0     0    0.25    1.19    1.19      3.4   65.0  16.0  130.0  390.0
                                                                                     153   570   559   254   641   320                              0.0   77.6  19.1  155.1  465.3
   0    0.0   61.7         457    132    682    676    463    653    670             82    59     0     0     0     0                              3.0   66.5  16.4  133.0  398.8
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 570 F    WINDBOX P= 2.50IN H2O    FURNACE P= 0.01IN H2O    COAL P= 2.70IN H2O
MILL IN=  399 F   MILL OUT= 157 F   EXIT= 1204 F   EXIT(sp)= 1000 F   SMPL=  963 F  SORBENT= VICRON    MILL INJECTION    SORBENT LBS/HR= 136    SORBENT VELOCITY=  82 FT/SEC   SORBENT AIR FLOW=  220  SCFM   (Ca)/(S)=  1.27
VALID DATA POINT #  22   ELAPSED TIME, MIN   4   RECORD ON TRK   0   FILE  63   LIMESTONE INJECTION

1176  10:40:41  56.3  9347  2519      0   2115   2104      0   2230   2643  11619    2519  9100     0     0     0     0    0.27    1.24    1.24      4.2   65.0  15.0  135.0  520.0
                                                                                     153   574   441   257   736   330                              0.0   81.3  18.8  160.0  650.0
   0    0.0   61.7         463    132    676    670    462    647    672             82    59     0     0     0     0                              3.0   69.6  16.1  144.6  557.1
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 574 F    WINDBOX P= 2.50IN H2O    FURNACE P= 0.01IN H2O    COAL P= 2.70IN H2O
MILL IN=  397 F   MILL OUT= 157 F   EXIT= 1230 F   EXIT(sp)= 1276 F   SMPL=  940 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  23   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  64   BASELINE
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DATE          :   04-11-84                      TER DIA         :   8
SYSTEM        :   LWS                           SPREADER        :   4IN 4028
BURNER        :   CCV-100                       B.P/R.H.        :   29.53/50.0
FUEL          :   UTAH9                         OIL CHECK       :   2.76
---------------------------------------------------------------------------------------------------------------------------------------------------------------
              LOAD          PRIM   V -2    V -3    V -4    V -5    V -8    V -7    TOTAL     PRIM   SEC  TER1  TER2  TER3  TER4     PRIM    SEC    TOTAL      O2    CO    CO2    NO    SO2
PT#    TIME  MBTU/HR  TA                           FLOW SCFM                                              FLOW SCFM                          SR (CUM)                                 MEASURED
  OIL          CALC  SCFM                                                                                  TEMP (F)                                                             CORR TO 0% O2
(%)    LOAD    MEAS                                TEMP (F)                                          VELOCITY (FT/SEC)                                                          CORR TO 3% O2
---------------------------------------------------------------------------------------------------------------------------------------------------------------

 311  11:19:52  103.5  17103  2527     0    4182    4546     0    4611    4543   20410     2527 17803    0     0     0     0      0.15    1.19    1.19      3.4   40.0  15.2  545.0   0.0
                                                                                          157   595   805   297   771   432                               0.0   47.7  18.1  650.3   0.0
   0    0.0     99.9          574    176     667     660    518     642     650             83   118     0     0     0     0                               3.0   40.9  15.5  557.4   0.0
K-TRON=0100 LBS/HR     REGISTER POSITION=   30 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 595 F     WINDBOX P= 6.00IN H20    FURNACE P= 0.20IN H20    COAL P= 0.30IN H20
MILL IN=  519 F   MILL OUT= 157 F   EXIT= 1446 F   EXIT(sp)= 1467 F   SMPL= 1224 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0   1   ELAPSED TIME, MIN   8   RECORD ON TRK   0   FILE  65   OPTIMIZATION TEST

 334  11:31:35  102.9  17070  2365     0    4191    4553     0    4624    4553   20286     2365 17921    0     0     0     0      0.14    1.19    1.19      3.4   40.0  15.0  565.0  600.0
                                                                                          159   592   761   304   750   435                               0.0   47.7  17.9  674.1  715.9
   0    0.0     99.9          592    177     662     651    519     637     652             78   118     0     0     0     0                               3.0   40.9  15.3  577.8  613.6
K-TRON=0100 LBS/HR     REGISTER POSITION=   30 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 592 F     WINDBOX P= 6.00IN H20    FURNACE P= 0.25IN H20    COAL P= 0.60IN H20
MILL IN=  534 F   MILL OUT= 155 F   EXIT= 1453 F   EXIT(sp)= 1462 F   SMPL= 1228 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0   2   ELAPSED TIME. MIN   7   RECORD ON TRK   0   FILE  66   SPREADER ADJUSTMENT

 424  12:15:51  102.6  17043  2711     0    4015    4352     0    4481    4462   20021     2711 17310    0     0     0     0      0.16    1.17    1.17      3.2   40.0  15.2  540.0  580.0
                                                                                          160   593  1030   380   450   450                               0.0   47.2  17.9  637.1  684.3
   0    0.0     99.9          557    174     667     660    517     643     650             90   114     0     0     0     0                               3.0   40.4  15.4  546.1  586.5
K-TRON=0100 LBS/HR     REGISTER POSITION=   35 DEG    SPREADER POSITION=  -3.0 IN    WINDBOX T= 593 F     WINDBOX P= 6.00IN H20    FURNACE P= 0.25IN H20    COAL P= 0.00IN H20
MILL IN=  501 F   MILL OUT= 159 F   EXIT= 1403 F   EXIT(sp)= 1469 F   SMPL= 1232 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0   3   ELAPSED TIME. MIN   7   RECORD ON TRK   0   FILE  67   SPREADER ADJUSTMENT

 500  12:52:47  101.1  16708  2708     0    4123    4318     0    4472    4666   20278     2708 17578    0     0     0     0      0.16    1.21    ..21      3.7   40.0  14.8  540.0  560.0
                                                                                          157   594   515   307  1282   446                               0.0   48.6  18.0  655.5  679.8
   0    0.0     99.9          560    160     667     660    509     644     650             89   116     0     0     0     0                               3.0   41.6  15.4  561.8  582.7
K-TRON=0100 LBS/HR     REGISTER POSITION=   35 DEG    SPREADER POSITION=  -3.0 IN    WINDBOX T= 594 F     WINDBOX P= 6.50IN H20    FURNACE P= 0.15IN H20    COAL P= 9.00IN H20
MILL IN=  504 F   MILL OUT= 155 F   EXIT= 1426 F   EXIT(sp)= 1442 F   SMPL= 1212 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0   4   ELAPSED TIME. MIN   8   RECORD ON TRK   0   FILE  68   BASELINE

 572  13:25:51  103.0  17097  2679     0    4245    4535     0    4645    4664   20769     2679 18090    0     0     0     0      0.16    1.21    1.21      3.8   35.0  14.8  630.0  620.0
                                                                                          157   595   974   305   644   444                               0.0   42.7  18.1  769.2  757.0
   0    0.0     99.9          550    166     669     659    509     643     657             88   120     0     0     0     0                               3.0   36.6  15.5  659.3  648.8
K-TRON=0100 LBS/HR     REGISTER POSITION=   40 DEG    SPREADER POSITION=  -3.0 IN    WINDBOX T= 595 F     WINDBOX P= 6.50IN H20    FURNACE P= 0.15IN H20    COAL P= 9.00IN H20
MILL IN=  503 F   MILL OUT= 156 F   EXIT= 1527 F   EXIT(sp)= 1504 F   SMPL= 1274 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0   5   ELAPSED TIME. MIN   9   RECORD ON TRK   0   FILE  69   BASELINE

 665  14:16:30  103.7  17216  2837     0    4199    4428     0    4491    4609   20564     2837 17727    0     0     0     0      0.16    1.19    1.19      3.5   37.0  15.2  600.0  500.0
                                                                                          157   597   933   297   489   437                               0.0   44.4  18.2  720.0  600.0
   0    0.0     99.9          543    158     672     666    504     640     663             93   117     0     0     0     0                               3.0   38.1  15.6  617.1  514.3
K-TRON=0100 LBS/HR     REGISTER POSITION=   40 DEG    SPREADER POSITION=   0.0 IN    WINDBOX T= 597 F     WINDBOX P= 5.00IN H20    FURNACE P= 0.20IN H20    COAL P= 7.50IN H20
MILL IN=  400 F   MILL OUT= 157 F   EXIT= 1507 F   EXIT(sp)= 1524 F   SMPL= 1274 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0   6   ELAPSED TIME. MIN   8   RECORD ON TRK   0   FILE  70   BASELINE-OPTIMUM

 722  14:45:14  103.0  17107  2799     0    4016    4555     0    4621    4556   20548     2799 17749    0     0     0     0      0.16    1.20    1.20      3.6   35.0  14.8  540.0  520.0
                                                                                          157   596   910   380   520   440                               0.0   42.2  17.9  651.7  627.6
   0    0.0     99.9          542    155     660     661    496     645     660             92   117     0     0     0     0                               3.0   36.2  15.3  558.6  537.9
K-TRON=0100 LBS/HR     REGISTER POSITION=   47 DEG    SPREADER POSITION=   0.0 IN    WINDBOX T= 596 F     WINDBOX P= 3.50IN H20    FURNACE P= 0.25IN H20    COAL P= 7.40IN H20
MILL IN=  400 F   MILL OUT= 157 F   EXIT= 1503 F   EXIT(sp)= 1486 F   SMPL= 1265 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT 0   7   ELAPSED TIME. MIN   7   RECORD ON TRK   0   FILE  71   REGISTER ADJUSTMENT
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DATE      :  04-11-84                            TER DIA      :  8
SYSTEM    :  LWS                                 SPREADER     :  4IN 4028
BURNER    :  CCV-100                             R.P/R.H.     :  29.53/50.0
FUEL      :  UTAH19                              OIL CHECK    :  2.76
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              LOAD          PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL     PRIM  SEC  TER1 TER2 TER3 TER4    PRIM   SEC    TOTAL     O2   CO   CO2   NO    SO2
PT#   TIME   MMTU/HR  TA                                FLOW SCFM                                 FLOW SCFM                       SR (CUM)                     MEASURED
 OIL         CALC   SCFM                                                                          TEMP (F)                                                   CORR TO 0% O2
(%)   LOAD   MEAS                                       TEMP (F)                               VELOCITY (FT/SEC)                                             CORR TO 3% O2
---------------------------------------------------------------------------------------------------------------------------------------

 763  15:05:00  102.6  17637   2858     0   3345   4253     0   4297   3931   18685     2850 15827    0    0    0    0     0.17   1.10   1.10     1.9  43.0  16.4  390.0  630.0
                                                                                      150   603  866  313  586  457                           0.0  47.3  18.0  428.0  692.7
   0     0.0    99.9            537   156    680    674   584    657    672              94   105    0    0    0    0                           3.0  40.5  15.5  367.5  593.7
K-TRON=8100 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 603 F     WINDBOX P= 3.50IN H2O    FURNACE P= 0.25IN H2O    COAL P= 7.40IN H2O
MILL IN=  478 F  MILL OUT= 158 F  EXIT= 1477 F  EXIT(sp)= 1463 F  SMPL= 1225 F         SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC  SORBENT AIR FLOW=   0  SCFM  (Ca)/(S)=  0.00
VALID DATA POINT #  8  ELAPSED TIME, MIN  3  RECORD ON TRK  0  FILE  72  MIN. EXCESS AIR

 700  15:13:05  101.3  16025   2784     0   4293   4538     0   4639   4782   21036     2784 18252    0    0    0    0     0.17   1.25   1.25     4.3  35.0  14.0  570.0  400.0
                                                                                      157   606  751  305  631  443                           0.0  44.0  17.6  716.0  603.6
   0     0.0    99.9            540   156    679    672   584    657    674              92   122    0    0    0    0                           3.0  37.7  15.1  614.4  517.4
K-TRON=8100 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 606 F     WINDBOX P= 4.00IN H2O    FURNACE P= 0.25IN H2O    COAL P= 7.40IN H2O
MILL IN=  486 F  MILL OUT= 158 F  EXIT= 1490 F  EXIT(sp)= 1500 F  SMPL= 1269 F         SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC  SORBENT AIR FLOW=   0  SCFM  (Ca)/(S)=  0.00
VALID DATA POINT #  9  ELAPSED TIME, MIN  7  RECORD ON TRK  0  FILE  73  EXCESS AIR CURVE

 800  15:25:15   98.1  14293   2760     0   4583   4742     0   4965   5135   22194     2760 19426    0    0    0    0     0.17   1.36   1.36     5.7  30.0  12.8  615.0    0.0
                                                                                      157   593  698  294  663  427                           0.0  41.2  17.6  844.1    0.0
   0     0.0    99.9            542   153    659    653   493    640    653              91   120    0    0    0    0                           3.0  35.3  15.1  723.5    0.0
K-TRON=8100 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 593 F     WINDBOX P= 4.50IN H2O    FURNACE P= 0.25IN H2O    COAL P= 7.40IN H2O
MILL IN=  486 F  MILL OUT= 163 F  EXIT= 1482 F  EXIT(sp)= 1505 F  SMPL= 1286 F         SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC  SORBENT AIR FLOW=   0  SCFM  (Ca)/(S)=  0.00
VALID DATA POINT #  10  ELAPSED TIME, MIN  6  RECORD ON TRK  0  FILE  74  MAXIMUM EXCESS AIR

 875  15:55:37   99.0  16570   2836     0   3812   4437     0   4587   4467   20139     2836 17303    0    0    0    0     0.17   1.21   1.21     3.0  35.0  14.0  520.0  500.0
                                                                                      156   569  827  304  562  439                           0.0  42.7  18.1  634.9  610.5
   0     0.0    99.9            539   153    660    655   493    640    653              93   114    0    0    0    0                           3.0  36.6  15.5  544.2  523.6
K-TRON=8100 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 589 F     WINDBOX P= 3.50IN H2O    FURNACE P= 0.25IN H2O    COAL P= 0.20IN H2O
MILL IN=  485 F  MILL OUT= 157 F  EXIT= 1490 F  EXIT(sp)= 1484 F  SMPL= 1252 F         SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC  SORBENT AIR FLOW=   0  SCFM  (Ca)/(S)=  0.00
VALID DATA POINT #  11  ELAPSED TIME, MIN  8  RECORD ON TRK  0  FILE  75  BASELINE

 923  16:20:26   95.7  15887   2580     0   3760   4409     0   4570   4529   19865     2580 17276    0    0    0    0     0.16   1.25   1.25     4.3  35.0  14.6  550.0  330.0
                                                                                      154   599  862  306  547  446                           0.0  44.0  18.4  691.6  415.0
   0     0.0    99.9            562   154    672    667   499    649    666              85   115    0    0    0    0                           3.0  37.7  15.7  592.0  355.7
K-TRON=8100 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 599 F     WINDBOX P= 3.50IN H2O    FURNACE P= 0.25IN H2O    COAL P= 0.20IN H2O
MILL IN=  505 F  MILL OUT= 159 F  EXIT= 1501 F  EXIT(sp)= 1494 F  SMPL= 1277 F  SORBENT= VICRON     MILL INJECTION   SORBENT LBS/HR= 536   SORBENT VELOCITY=  85 FT/SEC   SORBENT AIR FLOW=  191  SCFM  (Ca)/(S)=  3.09
VALID DATA POINT #  12  ELAPSED TIME, MIN  6  RECORD ON TRK  0  FILE  76  LIMESTONE INJECTION

 941  16:34:05   99.6  16542   2534     0   3940   4392     0   4562   4553   19981     2534 17447    0    0    0    0     0.15   1.21   1.21     3.7  35.0  14.0  535.0  500.0
                                                                                      154   604  779  308  559  450                           0.0  42.5  18.0  649.4  606.9
   0     0.0    99.9            570   153    678    671   502    656    672              83   116    0    0    0    0                           3.0  36.4  15.4  556.6  520.2
K-TRON=8100 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 604 F     WINDBOX P= 3.50IN H2O    FURNACE P= 0.25IN H2O    COAL P= 0.20IN H2O
MILL IN=  509 F  MILL OUT= 172 F  EXIT= 1522 F  EXIT(sp)= 1500 F  SMPL= 1275 F         SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC , SORBENT AIR FLOW=   0  SCFM  (Ca)/(S)=  0.00
VALID DATA POINT #  13  ELAPSED TIME, MIN  5  RECORD ON TRK  0  FILE  77  BASELINE

 965  16:45:51   98.2  16310   2564     0   3962   4396     0   4475   4416   19813     2564 17249    0    0    0    0     0.16   1.21   1.21     3.0  35.0  14.0  550.0  340.0
                                                                                      153   605  896  312  522  453                           0.0  42.7  18.1  671.5  415.1
   0     0.0    99.9            570   153    680    674   563    659    673              84   115    0    0    0    0                           3.0  36.6  15.5  575.6  355.0
K-TRON=8100 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 605 F     WINDBOX P= 3.50IN H2O    FURNACE P= 0.25IN H2O    COAL P= 0.20IN H2O
MILL IN=  511 F  MILL OUT= 153 F  EXIT= 1517 F  EXIT(sp)= 1513 F  SMPL= 1291 F  SORBENT= VICRON     MILL INJECTION   SORBENT LBS/HR= 414   SORBENT VELOCITY=  84 FT/SEC   SORBENT AIR FLOW=  198  SCFM  (Ca)/(S)=  2.33
VALID DATA POINT #  14  ELAPSED TIME, MIN  8  RECORD ON TRK  0  FILE  78  FILTER PLUGGED
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DATE          :    04-11-84                          TER DIA        :    8
SYSTEM        :    LWS                               SPREADER       :    4IN 4028
BURNER        :    CCV-100                           R.P/R.H.       :    29.53/50.0
FUEL          :    UTAH9                             OIL CHECK      :    2.76
--------------------------------------------------------------------------------------------------------------------------------------------------
            LOAD         PRIM   V -2   V -3   V -4   V -5   V -6   V -7   TOTAL     PRIM   SEC  TER1  TER2  TER3  TER4     PRIM    SEC    TOTAL       O2    CO    CO2    NO     SO2
PT#   TIME MBTU/HR  TA                     FLOW SCFM                                          FLOW SCFM                          SR (CUM)                            MEASURED
 OIL        CALC  SCFM                                                                        TEMP (F)                                                           CORR TO 0% O2
(%)  LOAD   MEAS                           TEMP (F)                                       VELOCITY (FT/SEC)                                                      CORR TO 3% O2
--------------------------------------------------------------------------------------------------------------------------------------------------

1014 17:13:37 100.3 16646 2536     0   3966   4416     0   4471   4383   19772     2536 17235    0     0     0     0      0.15    1.19  . 1.19       3.4  35.0  15.2  585.0  540.0
                                                                                     152   603  924   306   523   460                                 0.0  41.0  18.1  602.6  644.3
  0    0.0   99.9         571    152    679    674    501    657    672              83   115    0     0     0     0                                 3.0  35.0  15.5  516.5  552.3
K-TRUN=0100 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 603 F     WINDBOX P= 3.50IN H20   FURNACE P= 0.25IN H20   COAL P= 0.20IN H20
MILL IN=  514 F   MILL OUT= 163 F   EXIT= 1494 F   EXIT(sp)= 1513 F   SMPL= 1264 F         SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  15   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  79   BASELINE

1029 17:18:54  99.4 16583 2612     0   3965   4387     0   4484   4374   19822     2612 17210    0     0     0     0      0.16    1.20    1.20       3.6  35.0  15.0  530.0  420.0
                                                                                     154   604  937   303   521   458                                 0.0  42.2  18.1  639.7  506.9
  0    0.0   99.9         567    151    680    674    500    656    673              85   115    0     0     0     0                                 3.0  36.2  15.5  540.3  434.5
K-TRUN=0100 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 604 F     WINDBOX P= 3.50IN H20   FURNACE P= 0.25IN H20   COAL P= 0.20IN H20
MILL IN=  511 F   MILL OUT= 161 F   EXIT= 1490 F   EXIT(sp)= 1516 F   SMPL= 1202 F  SORBENT= VICRON     MILL INJECTION   SORBENT LBS/HR= 393   SORBENT VELOCITY=  85 FT/SEC   SORBENT AIR FLOW=  199  SCFM  [Ca]/[S]=  2.10
VALID DATA POINT #  16   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  80   ~~BASELINE~~ LIMESTONE

1053 17:31:50  98.0 16275 2604     0   3985   4424     0   4485   4386   19884     2604 17200    0     0     0     0      0.16    1.22    1.22       3.9  35.0  14.6  525.0  440.0
                                                                                     154   603  870   298   547   454                                 0.0  43.0  17.9  644.7  540.4
  0    0.0   99.9         564    150    679    674    498    659    671              85   115    0     0     0     0                                 3.0  36.8  15.4  552.6  463.2
K-TRUN=0100 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 603 F     WINDBOX P= 3.50IN H20   FURNACE P= 0.25IN H20   COAL P= 0.20IN H20
MILL IN=  506 F   MILL OUT= 157 F   EXIT= 1487 F   EXIT(sp)= 1507 F   SMPL= 1271 F  SORBENT= VICRON     MILL INJECTION   SORBENT LBS/HR= 197   SORBENT VELOCITY=  85 FT/SEC   SORBENT AIR FLOW=  198  SCFM  [Ca]/[S]=  1.11
VALID DATA POINT #  17   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE  81   LIMESTONE INJECTION

1076 17:43:36  98.0 16269 2525     0   4060   4477     0   4487   4442   19991     2525 17467    0     0     0     0      0.16    1.23    1.23       4.0  35.0  14.4  540.0  500.0
                                                                                     152   605  837   297   564   456                                 0.0  43.2  17.8  667.1  617.6
  0    0.0   99.9         571    150    680    674    499    660    674              82   117    0     0     0     0                                 3.0  37.1  15.2  571.0  529.4
K-TRUN=0100 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 605 F     WINDBOX P= 3.50IN H20   FURNACE P= 0.25IN H20   COAL P= 0.20IN H20
MILL IN=  510 F   MILL OUT= 154 F   EXIT= 1492 F   EXIT(sp)= 1522 F   SMPL= 1276 F         SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  18   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  82   BASELINE
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DATE        :   04-16-84                                   TER DIA      :   8
SYSTEM      :   LWS                                        SPREADER     :   4IN 4@28
BURNER      :   CCV-100                                    B.P/R.H.     :   29.5/29.5
FUEL        :   UTAH9                                      OIL CHECK    :   0.22
---------------------------------------------------------------------------------------------------------------------------------------------
              LOAD          PRIM   V -2   V -3   V -4   V -5   V -6   V -7   TOTAL     PRIM  SEC  TER1  TER2  TER3  TER4    PRIM   SEC    TOTAL    O2   CO    CO2   NO    SO2
PT#    TIME  MBTU/HR  TA                         FLOW SCFM                                   FLOW SCFM                           SR (CUM)                    MEASURED
  OIL          CALC  SCFM                                                                   TEMP (F)                                                    CORR TO 0% O2
(%)   LOAD     MEAS                              TEMP (F)                                VELOCITY (FT/SEC)                                              CORR TO 3% O2
---------------------------------------------------------------------------------------------------------------------------------------------

 330  10:57:18  103.1  17113  2671   000  3886   3999     0   4526   4585  20555     2671 16996  444     0     0     0    0.16   1.18   1.20     3.6  40.0  15.2  385.0  520.0
                                                                                      149   591  470   297   528   446                          0.0  40.3  18.3  464.7  627.6
   0    0.0  101.1          451   632   671    660   547    646    659                  87   112   39    32     0     0                          3.0  41.4  15.7  390.3  537.9
K-TRON=8200 LBS/HR     REGISTER POSITION=  43 DEG   SPREADER POSITION=  -6.0 IN    WINDBOX T= 591 F      WINDBOX P= 4.00IN H2O    FURNACE P= 0.40IN H2O    COAL P=11.00IN H2O
MILL IN=  422 F   MILL OUT= 146 F   EXIT= 1477 F   EXIT(sp)= 1401 F   SMPL= 1194 F         SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  1   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  85   UNSTAGED

 477  12:10:39  101.4  16841  2645   954  3404   3506   511   4640   4597  20343     2645 16234  477   477   255   255    0.16   1.12   1.21     3.7  40.0  15.2  425.0  540.0
                                                                                      151   500  466   361   520   496                          0.0  40.6  18.5  515.9  655.5
   0    0.0   97.4          452   626   663    650   505    640    652                  86   106  120    37    44    23                          3.0  41.6  15.8  442.2  561.0
K-TRON=7900 LBS/HR     REGISTER POSITION=  35 DEG   SPREADER POSITION=  -6.0 IN    WINDBOX T= 580 F      WINDBOX P= 6.00IN H2O    FURNACE P= 0.15IN H2O    COAL P=10.50IN H2O
MILL IN=  420 F   MILL OUT= 147 F   EXIT= 1510 F   EXIT(sp)= 1423 F   SMPL= 1217 F         SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  2   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  86   BASELINE-UNSTAGED

 510  12:25:09  101.0  16907  2694  1504  2986   3251  1505   4142   4112  20195     2694 14491  752   752   753   753    0.16   1.02   1.19     3.5  40.0  15.2  365.0  540.0
                                                                                      151   591  509   442   549   552                          0.0  40.0  18.2  430.0  640.0
   0    0.0   97.4          447   650   670    661   641    656    668                  88    95  275    64    71    72                          3.0  41.1  15.6  375.4  555.4
K-TRON=7900 LBS/HR     REGISTER POSITION=  35 DEG   SPREADER POSITION=  -6.0 IN    WINDBOX T= 591 F      WINDBOX P= 4.50IN H2O    FURNACE P= 0.35IN H2O    COAL P=11.50IN H2O
MILL IN=  416 F   MILL OUT= 140 F   EXIT= 1502 F   EXIT(sp)= 1303 F   SMPL= 1205 F         SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  3   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  87   STAGING CURVE

 562  12:49:37  103.4  17171  2690  2455  2500   3037  2659   3674   3292  20395     2690 12504 1227  1227  1330  1330    0.16   0.89   1.19     3.4  45.0  15.4  290.0  550.0
                                                                                      152   594  545   493   590   598                          0.0  53.7  18.4  346.0  656.2
   0    0.0   97.4          447   673   605    671   666    660    673                  88    83  404   110   121   132                          3.0  46.0  15.0  296.6  562.5
K-TRON=7900 LBS/HR     REGISTER POSITION=  35 DEG   SPREADER POSITION=  -6.0 IN    WINDBOX T= 594 F      WINDBOX P= 3.50IN H2O    FURNACE P= 0.35IN H2O    COAL P=10.50IN H2O
MILL IN=  415 F   MILL OUT= 152 F   EXIT= 1404 F   EXIT(sp)= 1230 F   SMPL= 1196 F         SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  4   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  88   STAGING CURVE

 594  13:06:36  105.6  17532  2696  3300  2310   2920  3553   3409   2895  21170     2696 11541 1694  1694  1777  1777    0.15   0.81   1.21     3.7  45.0  15.0  255.0  540.0
                                                                                      154   590  559   507   598   609                          0.0  54.6  18.2  309.5  655.5
   0    0.0   97.4          447   676   682    666   661    659    670                  88    76  666   154   169   179                          3.0  46.0  15.6  265.3  561.0
K-TRON=7900 LBS/HR     REGISTER POSITION=  35 DEG   SPREADER POSITION=  -6.0 IN    WINDBOX T= 590 F      WINDBOX P= 2.90IN H2O    FURNACE P= 0.35IN H2O    COAL P=11.00IN H2O
MILL IN=  415 F   MILL OUT= 153 F   EXIT= 1453 F   EXIT(sp)= 1495 F   SMPL= 1195 F         SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  5   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  89   STAGING CURVE

 652  13:33:57  105.0  17436  2700  4015  1067   2526  4214   2974   2415  20711     2700  9702 2008  2008  2107  2107    0.15   0.72   1.19     3.4  45.0  15.2  230.0  540.0
                                                                                      151   562  575   521   604   615                          0.0  53.7  18.1  274.4  644.3
   0    0.0   95.0          443   685   603    610   600    650    673                  88    64  802   105   201   213                          3.0  46.0  15.5  235.2  552.3
K-TRON=7700 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN    WINDBOX T= 582 F      WINDBOX P= 2.50IN H2O    FURNACE P= 0.10IN H2O    COAL P=11.00IN H2O
MILL IN=  409 F   MILL OUT= 140 F   EXIT= 1462 F   EXIT(sp)= 1502 F   SMPL= 1104 F         SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  6   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  90   BASELINE-STAGED

 745  14:21:05  106.7  17715  2794  3759  1620   2444  3056   2747   2110  19329     2794  8920 1879  1879  1920  1920    0.16   0.66   1.09     1.0 275.0  17.4  165.0  700.0
                                                                                      153   566  582   525   613   626                          0.0 300.0  19.0  180.5  765.6
   0    0.0   95.0          433   697   696    682   692    660    684                  91    50  747   174   190   197                          3.0 257.8  16.3  154.7  656.3
K-TRON=7700 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN    WINDBOX T= 586 F      WINDBOX P= 2.50IN H2O    FURNACE P= 0.10IN H2O    COAL P=11.00IN H2O
MILL IN=  400 F   MILL OUT= 153 F   EXIT= 1502 F   EXIT(sp)= 1305 F   SMPL= 1160 F         SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  7   ELAPSED TIME, MIN   2   RECORD ON TRK   0   FILE  91   MIN. EXCESS AIR-SMOKE POINT
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DATE       :  04-16-84                              TER DIA        :  8
SYSTEM     :  LWS                                   SPREADER       :  4IN 4028
BURNER     :  CCV-100                               B.P/R.H.       :  29.5/29.5
FUEL       :  UTAH9                                 OIL CHECK      :  0.22
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                 LOAD          PRIM   V -2   V -3   V -4   V -5   V -6   V -7   TOTAL    PRIM  SEC  TER1 TER2 TER3 TER4    PRIM   SEC   TOTAL      O2   CO   CO2   NO    SO2
PT#     TIME   MBTU/HR  TA       \                  FLOW SCFM                                          FLOW SCFM                   SR (CUM)                      MEASURED
  OIL           CALC   SCFM                                                                           TEMP (F)                                                 CORR TO 0% O2
(%)   LOAD      MEAS                                TEMP (F)                                        VELOCITY (FT/SEC)                                          CORR TO 3% O2
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 772  14:33:44  104.1 17203  2767   4609   1696   2489   5007   2767   2320   21736    2767 9273 2345 2345 2504 2504    0.16   0.70   1.26      4.4 45.0 14.6 220.0 520.0
                                                                                      153  582  504  534  615  623                           0.0 56.9 18.5 278.3 657.0
   0    0.0     95.0         435    600    678    670    666    658    676              90   61  953  219  237  255                           3.0 40.0 15.0 230.6 563.7
K-TRON=7700 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 582 F    WINDBOX P= 3.00IN H2O   FURNACE P= 0.10IN H2O    COAL P=11.00IN H2O
MILL IN=  400 F   MILL OUT= 140 F   EXIT= 1424 F   EXIT(sp)= 1457 F   SMPL= 1201 F           SORBENT LBS/HR=  0   SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  8   ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  92   EXCESS AIR CURVE

 794  14:44:54   98.1 16296  2815   4712   1801   2396   5212   2806   2443   22185    2815 9445 2356 2356 2606 2606    0.17   0.75   1.36      5.7 40.0 13.2 230.0 480.0
                                                                                      152  575  575  520  607  614                           0.0 54.9 18.1 315.7 650.0
   0    0.0     95.0         437    676    676    664    674    647    660              92   61  967  219  237  264                           3.0 47.1 15.5 270.6 564.7
K-TRON=7700 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 575 F    WINDBOX P= 3.00IN H2O   FURNACE P= 0.10IN H2O    COAL P=11.00IN H2O
MILL IN=  402 F   MILL OUT= 150 F   EXIT= 1405 F   EXIT(sp)= 1240 F   SMPL= 1107 F           SORBENT LBS/HR=  0   SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  9   ELAPSED TIME, MIN   3   RECORD ON TRK   0   FILE  93   MAX. EXCESS AIR

 849  15:09:46  100.0 17930  2724   4656   1649   2421   4224   2796   2252   20723    2724 9119 2320 2320 2112 2112    0.15   0.66   1.16      2.9 75.0 15.0 200.0 600.0
                                                                                      150  570  583  523  616  622                           0.0 87.0 18.3 232.0 696.1
   0    0.0     95.0         440    600    675    663    681    659    673              89   59  872  216  236  215                           3.0 74.6 15.7 198.9 596.7
K-TRON=7700 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 570 F    WINDBOX P= 3.00IN H2O   FURNACE P= 0.10IN H2O    COAL P=11.00IN H2O
MILL IN=  403 F   MILL OUT= 151 F   EXIT= 1457 F   EXIT(sp)= 1323 F   SMPL= 1202 F           SORBENT LBS/HR=  0   SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  10  ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  94   EXCESS AIR CURVE

 917  15:36:13  104.0 17261  2676   4571   1838   2476   4211   2844   2473   21000    2676 9631 2205 2205 2106 2106    0.16   0.71   1.22      3.9 40.0 14.6 245.0 540.0
                                                                                      150  587  584  527  616  623                           0.0 49.1 17.9 300.9 663.2
   0    0.0     95.0         446    687    687    684    685    661    678              87   63  863  212  232  215                           3.0 42.1 15.4 257.9 560.4
K-TRON=7700 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 587 F    WINDBOX P= 3.00IN H2O   FURNACE P= 0.10IN H2O    COAL P=11.00IN H2O
MILL IN=  415 F   MILL OUT= 152 F   EXIT= 1466 F   EXIT(sp)= 1405 F   SMPL= 1200 F           SORBENT LBS/HR=  0   SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #  11  ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE  95   BASELINE

 951  15:59:40  101.3 16812  2515   4601   1600   2416   4242   2002   2204   20539    2515 9102 2301 2301 2121 2121    0.15   0.70   1.22      3.9 40.0 15.0 230.0 270.0
                                                                                      140  586  589  530  620  627                           0.0 49.1 18.4 282.5 331.6
   0    0.0     95.0         454    600    689    689    680    662    678              82   60  873  214  234  217                           3.0 42.1 15.0 242.1 284.7
K-TRON=7700 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 586 F    WINDBOX P= 3.00IN H2O   FURNACE P= 0.10IN H2O    COAL P=11.00IN H2O
MILL IN=  425 F   MILL OUT= 147 F   EXIT= 1480 F   EXIT(sp)= 1532 F   SMPL= 1240 F  SORBENT= VICRON    MILL INJECTION   SORBENT LBS/HR= 622   SORBENT VELOCITY= 82 FT/SEC   SORBENT AIR FLOW= 235  SCFM  [Ca]/[S]=  3.39
VALID DATA POINT #  12  ELAPSED TIME, MIN   5   RECORD ON TRK   0   FILE  96   LIMESTONE  INJECTION

 976  16:12:23  102.2 16961  2555   4614   1607   2456   4240   2003   2250   20604    2555 9196 2307 2307 2120 2120    0.15   0.69   1.21      3.0 40.0 15.6 225.0 330.0
                                                                                      147  565  589  530  622  626                           0.0 40.0 19.0 274.7 402.9
   0    0.0     95.0         451    693    609    691    600    665    602              83   60  874  215  235  217                           3.0 41.9 16.3 235.5 345.5
K-TRON=7700 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 585 F    WINDBOX P= 3.00IN H2O   FURNACE P= 0.10IN H2O    COAL P=11.00IN H2O
MILL IN=  410 F   MILL OUT= 147 F   EXIT= 1461 F   EXIT(sp)= 1508 F   SMPL= 1226 F  SORBENT= VICRON    MILL INJECTION   SORBENT LBS/HR= 416   SORBENT VELOCITY= 83 FT/SEC   SORBENT AIR FLOW= 235  SCFM  [Ca]/[S]=  2.25
VALID DATA POINT #  13  ELAPSED TIME. MIN   8   RECORD ON TRK   0   FILE  97   LIMESTONE INJECTION

 990  16:27:53  101.1 16707  2550   4570   1656   2471   4222   2790   2233   20509    2550 9156 2289 2289 2111 2111    0.15   0.70   1.22      3.9 45.0 15.4 230.0 400.0
                                                                                      140  549  593  533  625  631                           0.0 55.3 18.9 282.5 491.2
   0    0.0     95.0         452    695    694    694    691    667    684              63   60  873  214  234  217                           3.0 47.4 16.2 242.1 421.1
K-TRON=7700 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 589 F    WINDBOX P= 3.00IN H2O   FURNACE P= 0.10IN H2O    COAL P=11.00IN H2O
MILL IN=  421 F   MILL OUT= 145 F   EXIT= 1480 F   EXIT(sp)= 1523 F   SMPL= 1231 F  SORBENT= VICRON    MILL INJECTION   SORBENT LBS/HR= 239   SORBENT VELOCITY= 83 FT/SEC   SORBENT AIR FLOW= 245  SCFM  [Ca]/[S]=  1.30
VALID DATA POINT #  14  ELAPSED TIME. MIN   6   RECORD ON TRK   0   FILE  98   LIMESTONE INJECTION
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DATE      :  04-18-84                                   TER DIA      :  8
SYSTEM    :  LWS                                        SPREADER     :  4IN 4028
BURNER    :  CCV-100                                    B.P/R.H.     :  29.58/43.0
FUEL      :  UTAH9                                      OIL CHECK    :  -2.25

               LOAD         PRIM    V -2    V -3    V -4    V -5    V -8    V -7    TOTAL     PRIM   SEC  TER1  TER2  TER3  TER4      PRIM     SEC     TOTAL       O2    CO    CO2    NO    SO2
PT#    TIME  MBTU/HR  TA                              FLOW SCFM                                            FLOW SCFM                       SR (CUM)                             MEASURED
  OIL          CALC  SCFM                                                                                  TEMP (F)                                                        CORR TO 0% O2
(%)   LOAD     MEAS                                   TEMP (F)                                        VELOCITY (FT/SEC)                                                    CORR TO 3% O2

 300  10:03:46   97.5 16195  2200     815    2969    3186     449    5226    4711   19563     2200 16091   407   407   225   225      0.14     1.13     1.21       3.7  35.0  14.8  430.0  510.0
                                                                                              164   560   437   265   490   369                                     0.0  42.5  18.0  522.0  619.1
   0    0.0      98.7          623     619     657     649     621     621     634              73   103   107    28    36    10                                     3.0  36.4  15.4  447.4  530.6
K-TRON=0000 LBS/HR    REGISTER POSITION=  35 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 560 F     WINDBOX P= 5.00IN H2O    FURNACE P= 0.30IN H2O    COAL P=11.00IN H2O
MICL IN=  560 F   MILL OUT= 174 F   EXIT= 1605 F   EXIT(sp)= 1649 F   SMPL= 1100 F             SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #   1   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE  99   BASELINE-UNSTAGED

 380  10:40:23  103.2 17131  2519    1918    3039    3002    1983    4204    4145   20811     2519 14470   959   959   952   952      0.15     0.99     1.21       3.8  40.0  14.8  390.0  530.0
                                                                                              166   573   538   453   573   562                                     0.0  48.8  18.1  476.2  647.1
   0    0.0      98.7          496     654     672     663     639     649     662              84    94   359    82    93    92                                     3.0  41.9  15.5  408.1  554.7
K-TRON=0000 LBS/HR    REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 573 F     WINDBOX P= 0.00IN H2O    FURNACE P= 0.35IN H2O    COAL P=11.00IN H2O
MILL IN=  463 F   MILL OUT= 174 F   EXIT= 1535 F   EXIT(sp)= 1612 F   SMPL= 1194 F             SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #   2   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 100   STAGING

 452  11:13:53  103.0 17233  2563    2736    2647    2643    2715    4161    3469   20934     2563 12920  1360  1360  1350  1350      0.15     0.98     1.21       3.8  40.0  14.8  320.0  510.0
                                                                                              156   562   541   470   580   574                                     0.0  48.8  18.1  390.7  622.7
   0    0.0      95.0          475     655     663     655     644     642     654              84    83   514   121   134   132                                     3.0  41.9  15.5  334.9  533.7
K-TRON=7700 LBS/HR    REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 562 F     WINDBOX P= 5.50IN H2O    FURNACE P= 0.25IN H2O    COAL P=10.00IN H2O
MILL IN=  437 F   MILL OUT= 157 F   EXIT= 1500 F   EXIT(sp)= 1627 F   SMPL= 1186 F             SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #   3   ELAPSED TIME, MIN   8   RECORD ON TRK   0   FILE 101   STAGING-BASELINE

 483  11:32:10   98.5 16361  2291    2713    2517    2531    2708    4009    3220   19989     2291 12277  1357  1357  1354  1354      0.14     0.09     1.22       3.9  40.0  15.0  335.0  260.0
                                                                                              154   563   537   473   575   566                                     0.0  49.1  18.4  411.4  319.0
   0    0.0      95.0          499     650     660     651     640     638     649              75    79   509   119   132   131                                     3.0  42.1  15.8  352.6  2707
K-TRON=7700 LBS/HR    REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 563 F     WINDBOX P= 5.50IN H2O    FURNACE P= 0.25IN H2O    COAL P=10.00IN H2O
MILL IN=  461 F   MILL OUT= 153 F   EXIT= 1523 F   EXIT(sp)= 1600 F   SMPL= 1201 F  SORBENT= VICRON   MILL INJECTION   SORBENT LBS/HR= 543   SORBENT VELOCITY=  75 FT/SEC   SORBENT AIR FLOW=  203  SCFM  [Ca]/[S]=  3.04
VALID DATA POINT #   4   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 102   LIMESTONE INJECTION

 520  11:56:43   98.4 16343  2332    2684    2459    2553    2692    3976    3156   19853     2332 12144  1342  1342  1346  1346      0.14     0.09     1.21       3.8  40.0  14.8  325.0  3000
                                                                                              150   569   537   473   577   568                                     0.0  48.8  18.1  396.0  3660
   0    0.0      95.0          499     650     665     658     645     641     656              76    78   505   118   131   130                                     3.0  41.9  15.5  340.1  3140
K-TRON=7700 LBS/HR    REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 569 F     WINDBOX P= 5.50IN H2O    FURNACE P= 0.25IN H2O    COAL P=10.00IN H2O
MILL IN=  457 F   MILL OUT= 149 F   EXIT= 1512 F   EXIT(sp)= 1525 F   SMPL= 1190 F  SORBENT= VICRON   MILL INJECTION   SORBENT LBS/HR= 380   SORBENT VELOCITY=  76 FT/SEC   SORBENT AIR FLOW=  203  SCFM  [Ca]/[S]=  2.10
VALID DATA POINT #   5   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 103   LIMESTONE INJECTION

 558  12:15:34   96.5 16017  2300    2660    2408    2497    2677    3952    3075   19568     2300 11931  1330  1330  1339  1339      0.14     0.09     1.22       3.9  40.0  14.6  315.0  320.0
                                                                                              145   575   551   480   587   578                                     0.0  49.1  17.9  386.8  393.0
   0    0.0      95.0          503     667     673     665     652     652     663              74    77   500   118   131   131                                     3.0  42.1  15.4  331.6  336.0
K-TRON=7700 LBS/HR    REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 575 F     WINDBOX P= 5.50IN H2O    FURNACE P= 0.25IN H2O    COAL P=10.00IN H2O
MILL IN=  462 F   MILL OUT= 143 F   EXIT= 1526 F   EXIT(sp)= 1527 F   SMPL= 1190 F  SORBENT= VICRON   MILL INJECTION   SORBENT LBS/HR= 240   SORBENT VELOCITY=  74 FT/SEC   SORBENT AIR FLOW=  203  SCFM  [Ca]/[S]=  1.42
VALID DATA POINT #   6   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 104   LIMESTONE INJECTION

 662  13:04:30  103.0 17235  2659    3414    2298    2281    3457    3666    3162   20937     2659 11407  1707  1707  1728  1728      0.15     0.82     1.21       3.8  45.0  15.0  295.0  520.0
                                                                                              150   562   545   488   586   587                                     0.0  54.9  18.3  360.2  634.9
   0    0.0      95.0          458     656     657     650     642     637     650              86    73   650   152   168   170                                     3.0  47.1  15.7  308.7  544.2
K-TRON=7700 LBS/HR    REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 562 F     WINDBOX P= 4.00IN H2O    FURNACE P= 0.25IN H2O    COAL P=10.00IN H2O
MILL IN=  428 F   MILL OUT= 140 F   EXIT= 1514 F   EXIT(sp)= 1520 F   SMPL= 1203 F             SORBENT LBS/HR=  0    SORBENT VELOCITY=  73 FT/SEC   SORBENT AIR FLOW=    0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT #   7   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE 105   BASELINE-STAGING
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DATE          :   04-18-84                                          TER DIA        :   8
SYSTEM        :   LWS                                               SPREADER       :   41N 4028
BURNER        :   CCV-100                                           B.P/R.H.       :   29.58/43.0
FUEL          :   UTAH9                                             OIL CHECK      :   -2.25
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              LOAD          PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL     PRIM  SEC  TER1  TER2  TER3  TER4    PRIM   SEC    TOTAL     O2   CO   CO2   NO    SO2
PT#   TIME   MBTU/HR  TA                         FLOW SCFM                                       FLOW SCFM                         SR (CUM)                      MEASURED
 OIL          CALC  SCFM                                                                         TEMP (F)                                                        CORR TO 0% O2
(%)   LOAD    MEAS                               TEMP (F)                                     VELOCITY (FT/SEC)                                                  CORR TO 3% O2
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696  13:20:58 104.4 17334  2673   4283   1793   1966   4411   3171   2524   20020     2673  9453  2142  2142  2205  2205    0.15   0.70   1.20      3.6  45.0  15.4  240.0  540.0
                                                                                       150   561   566   500   596   594                              0.0  54.3  10.6  289.7  651.7
 0     0.0    93.7          457    659    655    649    647    636    650               87    60   840   195   213   219                              3.0  46.6  15.9  240.3  550.6
K-TRON=7600 LBS/HR    REGISTER POSITION=  23 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 561 F      WINDBOX P= 2.60IN H2O    FURNACE P= 0.10IN H2O    COAL P=11.00IN H2O
MILL IN=  423 F   MILL OUT= 151 F   EXIT= 1404 F   EXIT(sp)= 1404 F   SMPL= 1189 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=  73 FT/SEC   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  8   ELAPSED TIME, MIN   8   RECORD ON TRK   0   FILE 106   BASELINE-STAGED

713  13:32:12 100.4 16665  2694   4296   1779   1919   4392   3157   2470   20715     2694  9333  2140  2140  2196  2196    0.16   0.72   1.24      4.2  45.0  14.8  250.0  390.0
                                                                                       150   562   550   505   571   583                              0.0  56.3  10.5  312.5  487.5
 0     0.0    93.7          455    665    659    653    654    639    653               88    60   833   195   208   216                              3.0  48.2  15.9  267.9  417.9
K-TRON=7600 LBS/HR    REGISTER POSITION=  23 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 562 F      WINDBOX P= 2.60IN H2O    FURNACE P= 0.10IN H2O    COAL P=11.00IN H2O
MILL IN=  420 F   MILL OUT= 150 F   EXIT= 1471 F   EXIT(sp)= 1479 F   SMPL= 1192 F  SORBENT= VICRON       TERT INJECTION    SORBENT LBS/HR= 194     SORBENT VELOCITY= 114 FT/SEC   SORBENT AIR FLOW=  243  SCFM   (Ca)/(S)=  1.07
VALID DATA POINT #  9   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE 107   LIMESTONE INJECTION

792  14:00:01 100.6 16709  2654   4239   1601   1000   4300   3106   2422   20290     2654  9096  2120  2120  2154  2154    0.16   0.70   1.21      3.0  45.0  15.2  245.0  260.0
                                                                                       140   567   559   497   575   587                              0.0  54.9  10.6  299.1  317.4
 0     0.0    93.7          456    674    667    663    663    645    660               86    59   820   191   207   212                              3.0  47.1  15.9  256.4  272.1
K-TRON=7600 LBS/HR    REGISTER POSITION=  23 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 567 F      WINDBOX P= 2.60IN H2O    FURNACE P= 0.10IN H2O    COAL P=10.50IN H2O
MILL IN=  424 F   MILL OUT= 146 F   EXIT= 1500 F   EXIT(sp)= 1404 F   SMPL= 1206 F  SORBENT= VICRON       MILL INJECTION    SORBENT LBS/HR= 430     SORBENT VELOCITY=  86 FT/SEC   SORBENT AIR FLOW=  203  SCFM   (Ca)/(S)=  2.36
VALID DATA POINT #  10  ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE 108   DUPONT QUESTIONABLE

851  14:40:04  99.7 16560  2601   4174   1677   1046   4275   3060   2369   20003     2601  8953  2087  2087  2130  2130    0.16   0.70   1.21      3.7  45.0  15.0  240.0  520.0
                                                                                       147   572   566   505   580   592                              0.0  54.6  10.2  291.3  631.2
 0     0.0    93.7          460    682    674    669    669    654    668               84    58   816   190   204   212                              3.0  46.0  15.6  249.7  541.0
K-TRON=7600 LBS/HR    REGISTER POSITION=  23 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 572 F      WINDBOX P= 2.60IN H2O    FURNACE P= 0.10IN H2O    COAL P=10.50IN H2O
MILL IN=  422 F   MILL OUT= 143 F   EXIT= 1476 F   EXIT(sp)= 1499 F   SMPL= 1201 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=  86 FT/SEC   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  11  ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE 109   BASELINE

807  14:57:44 103.0 17096  2560   4186   1790   2002   4226   3005   2556   20420     2560  9440  2093  2093  2113  2113    0.15   0.70   1.19      3.5  45.0  15.4  265.0  290.0
                                                                                       147   574   570   513   587   601                              0.0  54.0  10.5  310.0  340.0
 0     0.0    93.7          467    681    674    669    670    653    669               83    61   816   192   206   211                              3.0  46.3  15.0  272.6  290.3
K-TRON=7600 LBS/HR    REGISTER POSITION=  23 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 574 F      WINDBOX P= 2.60IN H2O    FURNACE P= 0.10IN H2O    COAL P=10.50IN H2O
MILL IN=  429 F   MILL OUT= 147 F   EXIT= 1523 F   EXIT(sp)= 1505 F   SMPL= 1220 F  SORBENT= VICRON       TERT INJECTION    SORBENT LBS/HR= 552     SORBENT VELOCITY=  95 FT/SEC   SORBENT AIR FLOW=  203  SCFM   (Ca)/(S)=  2.96
VALID DATA POINT #  12  ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 110   LIMESTONE INJECTION

917  15:11:40  99.0 16570  2500   4103   1021   2033   4253   3075   2542   20407     2500  9472  2091  2091  2126  2126    0.16   0.73   1.24      4.1  45.0  14.0  260.0  290.0
                                                                                       140   572   566   510   582   590                              0.0  55.9  10.4  323.1  360.4
 0     0.0    93.7          467    674    670    665    664    650    664               84    61   815   191   205   212                              3.0  47.9  15.0  276.9  300.9
K-TRON=7600 LBS/HR    REGISTER POSITION=  23 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 572 F      WINDBOX P= 2.60IN H2O    FURNACE P= 0.10IN H2O    COAL P=10.50IN H2O
MILL IN=  429 F   MILL OUT= 145 F   EXIT= 1501 F   EXIT(sp)= 1493 F   SMPL= 1220 F  SORBENT= VICRON       TERT INJECTION    SORBENT LBS/HR= 399     SORBENT VELOCITY=  95 FT/SEC   SORBENT AIR FLOW=  203  SCFM   (Ca)/(S)=  2.21
VALID DATA POINT #  13  ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 111   LIMESTONE INJECTION

927  15:25:19 104.9 17419  2557   4100   1762   1931   4265   3090   2440   20241     2557  9231  2094  2094  2132  2132    0.15   0.60   1.16      3.0  45.0  15.4  250.0  540.0
                                                                                       146   569   571   506   605   603                              0.0  52.5  10.0  291.7  630.0
 0     0.0    93.7          460    670    671    668    667    647    663               83    60   821   191   210   213                              3.0  45.0  15.4  250.0  540.0
K-TRON=7600 LBS/HR    REGISTER POSITION=  23 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 569 F      WINDBOX P= 2.60IN H2O    FURNACE P= 0.10IN H2O    COAL P=10.50IN H2O
MILL IN=  431 F   MILL OUT= 145 F   EXIT= 1532 F   EXIT(sp)= 1515 F   SMPL= 1226 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=  95 FT/SEC   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  14 . ELAPSED TIME, MIN   4   RECORD ON TRK   0   FILE 112   BASELINE
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DATE        :  04-18-84                              TER DIA     :  8
SYSTEM      :  LWS                                   SPREADER    :  4IN 4028
BURNER      :  CCV-100                               B.P/R.H.    :  29.58/43.0
FUEL        :  UTAH9                                 OIL CHECK   :  -2.25
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                LOAD         PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL    PRIM  SEC  TER1  TER2  TER3  TER4    PRIM  SEC    TOTAL     O2   CO   CO2   NO    SO2
PT#   TIME   MBTU/HR  TA                         FLOW SCFM                                     FLOW SCFM                          SR (CUM)                         MEASURED
  OIL          CALC  SCFM                                                                     TEMP (F)                                                         CORR TO 0% O2
(%)   LOAD     MEAS                              TEMP (F)                                VELOCITY (FT/SEC)                                                     CORR TO 3% O2
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984 15:46:58 101.6 16873 2587  4181   1629   1927   4268   3885   2344   28842    2587 9906  2891  2891  2144  2144    0.15   0.69   1.19      3.4  50.0  15.0  250.0  230.0
                                                                                  145  568   561   585   583   593                               0.0  59.7  17.9  290.3  274.4
  0    0.0    93.7          465    676    667    661    662    643    660          83   58   814   198   205   213                               3.0  51.1  15.3  255.7  235.2
E-1kW=7600 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 560 F    WINDBOX P= 2.60IN H2O    FURNACE P= 0.10IN H2O    COAL P=10.50IN H2O
MILL IN=  426 F   MILL OUT= 142 F   EXIT= 1533 F   EXIT(sp)= 1517 F   SMPL= 1240 F  SORBENT= Ca(OH)2   TERT INJECTION    SORBENT LBS/HR= 583    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  4.15
VALID DATA POINT #  15   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE 113   LIME INJECTION

996 16:04:16  99.5 16514 2592  4128   1792   1930   4241   3132   2476   28291    2592 9331  2864  2864  2121  2121    0.16   0.72   1.23      4.0  40.0  14.4  270.0  400.0
                                                                                  149  571   572   512   600   611                               0.0  49.4  17.8  333.5  592.9
  0    0.0    93.7          465    681    673    660    666    649    665          84   60   813   189   200   214                               3.0  42.4  15.2  265.9  500.2
E-1kW=7600 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 571 F    WINDBOX P= 2.60IN H2O    FURNACE P= 0.10IN H2O    COAL P=10.50IN H2O
MILL IN=  426 F   MILL OUT= 147 F   EXIT= 1503 F   EXIT(sp)= 1531 F   SMPL= 1227 F            SORBENT LBS/HR=   0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  16   ELAPSED TIME, MIN   4   RECORD ON TRK   0   FILE 114   BASELINE

1039 16:25:32 101.6 16867 2559  4143   1712   1996   4257   3106   2406   28260   2559 9381  2872  2872  2120  2120    0.15   0.70   1.20      3.6  45.0  15.0  260.0  510.0
                                                                                  146  570   571   510   606   605                               0.0  54.3  18.1  313.0  615.5
  0    0.0    93.7          467    676    670    665    663    648    665          83   60   815   189   200   213                               3.0  46.6  15.5  269.0  527.6
E-1kW=7600 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 570 F    WINDBOX P= 2.60IN H2O    FURNACE P= 0.10IN H2O    COAL P=10.50IN H2O
MILL IN=  425 F   MILL OUT= 142 F   EXIT= 1507 F   EXIT(sp)= 1505 F   SMPL= 1219 F            SORBENT LBS/HR=   0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  17   ELAPSED TIME, MIN   4   RECORD ON TRK   0   FILE 115   BASELINE

1057 16:33:20  90.7 16300 2605  4158   1715   1942   4273   3101   2459   28253   2605 9217  2879  2879  2136  2136    0.16   0.72   1.24      4.1  30.0  14.6  265.0  270.0
                                                                                  146  570   561   511   577   593                               0.0  47.2  18.1  329.3  335.5
  0    0.0    93.7          467    676    670    666    665    651    664          84   60   810   190   203   212                               3.0  40.5  15.6  282.2  287.6
E-1kW=7600 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 570 F    WINDBOX P= 2.60IN H2O    FURNACE P= 0.10IN H2O    COAL P=10.50IN H2O
MILL IN=  427 F   MILL OUT= 142 F   EXIT= 1524 F   EXIT(sp)= 1537 F   SMPL= 1238 F  SORBENT= Ca(OH)2   TERT INJECTION    SORBENT LBS/HR= 363    SORBENT VELOCITY=  95 FT/SEC   SORBENT AIR FLOW= 203  SCFM   [Ca]/[S]=  2.66
VALID DATA POINT #  18   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 116   LIME INJECTION

1062 16:50:54 102.0 17075 2549  4173   1690   1975   4265   3126   2391   28170   2549 9104  2806  2806  2133  2133    0.15   0.69   1.10      3.3  45.0  15.0  260.0  300.0
                                                                                  144  560   562   500   582   596                               0.0  53.4  17.8  300.5  450.0
  0    0.0    93.7          466    670    669    666    666    649    665          82   59   812   190   205   212                               3.0  45.0  15.3  264.4  306.1
E-1kW=7600 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 560 F    WINDBOX P= 2.60IN H2O    FURNACE P= 0.10IN H2O    COAL P=10.50IN H2O
MILL IN=  427 F   MILL OUT= 150 F   EXIT= 1536 F   EXIT(sp)= 1520 F   SMPL= 1243 F  SORBENT= Ca(OH)2   TERT INJECTION    SORBENT LBS/HR= 137    SORBENT VELOCITY=  95 FT/SEC   SORBENT AIR FLOW= 203  SCFM   [Ca]/[S]=  0.96
VALID DATA POINT #  19   ELAPSED TIME, MIN   0   RECORD ON TRK   0   FILE 117   LIME INJECTION

1092 17:00:06 100.4 16670 2582  4162   1673   1991   4274   3130   2332   28145   2582 9127  2801  2801  2137  2137    0.15   0.70   1.21      3.7  30.0  14.6  260.0  505.0
                                                                                  143  569   569   510   607   605                               0.0  46.1  17.7  315.6  613.0
  0    0.0    93.7          461    676    669    663    663    645    663          83   59   810   190   209   214                               3.0  39.5  15.2  270.5  525.0
E-1kW=7600 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 569 F    WINDBOX P= 2.60IN H2O    FURNACE P= 0.10IN H2O    COAL P=10.50IN H2O
MILL IN=  423 F   MILL OUT= 146 F   EXIT= 1407 F   EXIT(sp)= 1510 F   SMPL= 1221 F            SORBENT LBS/HR=   0    SORBENT VELOCITY=  95 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  20   ELAPSED TIME, MIN   4   RECORD ON TRK   0   FILE 118   ~~LIME INJECTION~~

1133 17:20:13 101.2 16802 2591  4191   1690   2001   4239   3127   2333   28101   2591 9159  2096  2096  2120  2120    0.15   0.70   1.20      3.6  45.0  14.0  255.0  530.0
                                                                                  143  566   550   509   500   594                               0.0  54.3  17.9  307.0  639.7
  0    0.0    93.7          461    673    666    661    662    644    661          83   59   806   191   205   210                               3.0  46.6  15.3  263.0  540.3
E-1kW=7600 LBS/HR     REGISTER POSITION=  23 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 566 F    WINDBOX P= 2.60IN H2O    FURNACE P= 0.10IN H2O    COAL P=10.50IN H2O
MILL IN=  423 F   MILL OUT= 141 F   EXIT= 1500 F   EXIT(sp)= 1537 F   SMPL= 1236 F            SORBENT LBS/HR=   0    SORBENT VELOCITY=  95 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  21   ELAPSED TIME, MIN   3   RECORD ON TRK   0   FILE 119   BASELINE
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DATE          :  04-18-84                                         TER DIA      :  8
SYSTEM        :  LWS                                              SPREADER     :  4IN 4028
BURNER        :  CCV-100                                          D.P/R.H.     :  29.58/43.0
FUEL          :  UTAH9                                            OIL CHECK    :  -2.25
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                  LOAD          PRIM    V -2    V -3    V -4    V -5    V -6    V -7    TOTAL    PRIM   SEC  TER1  TER2  TER3  TER4    PRIM    SEC    TOTAL        O2    CO    CO2    NO    SO2
PT#     TIME   MBTU/HR  TA                                 FLOW SCFM                                        FLOW SCFM                        SR (CUM)                                MEASURED
  OIL            CALC  SCFM                                                                                  TEMP (F)                                                          CORR TO 0% O2
(%)    LOAD      MEAS                                      TEMP (F)                                     VELOCITY (FT/SEC)                                                      CORR TO 3% O2
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1144  17:24:56  100.4  16664  2581    4175    1699    1903    4270    3146    2390   20243     2581  9217  2007  2007  2135  2135    0.15    0.71    1.21         3.0   45.0   14.0  260.0  210.0
                                                                                              143   566   559   505   570   592                                 0.0   54.9   10.1  317.4  256.4
  0     0.0      93.7         463     673     666     661     661     644     661              83    59   810   190   204   211                                 3.0   47.1   15.5  272.1  219.6
E-TRIM=7600 LBS/HR     REGISTER POSITION=   23 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 566 F     WINDBOX P= 2.60IN H20    FURNACE P= 0.10IN H20    COAL P=10.50IN H20
MILL IN=  423 F    MILL OUT= 149 F   EXIT= 1509 F   EXIT(sp)= 1511 F   SMPL= 1243 F  SORBENT=DOLOMITE    TERT INJECTION    SORBENT LBS/HR= 922    SORBENT VELOCITY=  95 FT/SEC   SORBENT AIR FLOW=  203  SCFM   (Ca)/(S)=  3.17
VALID DATA POINT #  22   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 120   DOLOMITE INJECTION

1159  17:37:09  101.3  16812  2591    4169    1690    2020    4277    3135    2418   20308     2591  9271  2005  2085  2139  2139    0.15    0.71    1.21         3.7   45.0   14.8  265.0  260.0
                                                                                              146   566   559   505   576   587                                 0.0   54.6   10.0  321.7  315.6
  0     0.0      93.7         465     675     667     662     661     647     664              84    60   810   189   203   211                                 3.0   46.0   15.4  275.7  270.5
E-TRIM=7600 LBS/HR     REGISTER POSITION=   23 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 568 F     WINDBOX P= 2.60IN H20    FURNACE P= 0.10IN H20    COAL P=10.50IN H20
MILL IN=  425 F    MILL OUT= 151 F   EXIT= 1531 F   EXIT(sp)= 1532 F   SMPL= 1246 F  SORBENT=DOLOMITE    TERT INJECTION    SORBENT LBS/HR= 725    SORBENT VELOCITY=  95 FT/SEC   SORBENT AIR FLOW=  203  SCFM   (Ca)/(S)=  2.47
VALID DATA POINT #  23   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 121   DOLOMITE INJECTION

1181  17:46:20  105.2  17459  2562    4165    1691    1904    4274    3142    2470   20288     2562  9207  2002  2002  2137  2137    0.15    0.60    1.16         3.0   50.0   15.2  255.0  380.0
                                                                                              140   566   559   506   574   609                                 0.0   58.3   17.7  297.5  443.3
  0     0.0      93.7         463     676     665     660     660     644     663              83    60   810   189   203   211                                 3.0   50.0   15.2  255.0  380.0
E-TRIM=7600 LBS/HR     REGISTER POSITION=   23 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 566 F     WINDBOX P= 2.60IN H20    FURNACE P= 0.10IN H20    COAL P=10.50IN H20
MILL IN=  426 F    MILL OUT= 159 F   EXIT= 1520 F   EXIT(sp)= 1539 F   SMPL= 1256 F  SORBENT=DOLOMITE    TERT INJECTION    SORBENT LBS/HR= 444    SORBENT VELOCITY=  95 FT/SEC   SORBENT AIR FLOW=  203  SCFM   (Ca)/(S)=  1.46
VALID DATA POINT #  24   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE 122   DOLOMITE INJECTION
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DATE          :     04-20-84                                     TER DIA       :     8
SYSTEM        :     LWS                                          SPREADER      :     4IN 4028
BURNER        :     CCV-100                                      B.P/R.H.      :     29.58/58.0
FUEL          :     UTAH9                                        OIL CHECK     :     -1.80
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              LOAD        PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL      PRIM   SEC  TER1  TER2  TER3  TER4     PRIM    SEC    TOTAL      O2    CO    CO2    NO     SO2
PT0    TIME  MBTU/HR  TA                       FLOW SCFM                                     FLOW SCFM                            SR (CUM)                           MEASURED
  OIL          CALC  SCFM                                                                    TEMP (F)                                                             CORR TO 0% O2
(%)   LOAD     MEAS                            TEMP (F)                                   VELOCITY (FT/SEC)                                                       CORR TO 3% O2
-----------------------------------------------------------------------------------------------------------------------------------------------------------

 229 08:31:39  98.2 16301  2510      0   4437   3973      0   4486   4396   19802      2510 17292     0     0     0     0     0.15    1.21    1.21      3.8  40.0  14.6  470.0  560.0
                                                                                      166   595   530   731   449   208                              0.0  48.8  17.8  573.8  683.7
  0   0.0   106.5         791    186    672    664    280    649    662                84   114     0     0     0     0                              3.0  41.9  15.3  491.9  586.0
K-1KIN=6800 LBS/HR     REGISTER POSITION=   43 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 595 F       WINDBOX P= 4.50IN H20     FURNACE P= 0.30IN H20     COAL P=10.50IN H20
MILL IN=  740 F   MILL OUT= 172 F   EXIT= 1516 F   EXIT(sp)= 1592 F   SMPL= 1194 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT 0   1   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE 123   BASELINE-UNSTAGED(BLOCKED PORTS)

 304 09:09:32 102.1 16946  2654      0   4413   3986      0   4593   4709   20354      2654 17701     0     0     0     0     0.16    1.20    1.20      3.6  45.0  14.8  530.0  560.0
                                                                                      171   593   663   713   435   335                              0.0  54.3  17.9  639.7  675.9
  0   0.0   101.1         672    200    669    661    292    647    661                89   117     0     0     0     0                              3.0  46.6  15.3  540.3  579.3
K-1KIN=6200 LBS/HR     REGISTER POSITION=   43 DEG    SPREADER POSITION=   0.0 IN    WINDBOX T= 593 F       WINDBOX P= 4.60IN H20     FURNACE P= 0.30IN H20     COAL P= 8.50IN H20
MILL IN=  614 F   MILL OUT= 172 F   EXIT= 1552 F   EXIT(sp)= 1634 F   SMPL= 1220 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT 0   2   ELAPSED TIME, MIN   8   RECORD ON TRK   0   FILE 124   SPREADER ADJUSTMENT

 357 09:34:10 102.7 17056  2541      0   4592   3924      0   4577   4626   20259      2541 17719     0     0     0     0     0.15    1.19    1.19      3.4  45.0  15.0  540.0  560.0
                                                                                      168   587   631   650   468   377                              0.0  53.7  17.9  644.3  668.2
  0   0.0   101.1         674    201    663    656    295    643    654                85   116     0     0     0     0                              3.0  46.0  15.3  552.3  572.1
K-1KIN=6200 LBS/HR     REGISTER POSITION=   43 DEG    SPREADER POSITION=  -3.0 IN    WINDBOX T= 587 F       WINDBOX P= 4.60IN H20     FURNACE P= 0.30IN H20     COAL P= 9.50IN H20
MILL IN=  619 F   MILL OUT= 160 F   EXIT= 1555 F   EXIT(sp)= 1648 F   SMPL= 1230 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT 0   3   ELAPSED TIME, MIN   8   RECORD ON TRK   0   FILE 125   SPREADER ADJUSTMENT

 386 09:47:34  98.9 16421  2486      0   4461   3799      0   4674   4416   19836      2486 17350     0     0     0     0     0.15    1.21    1.21      3.7  45.0  14.6  415.0  560.0
                                                                                      167   589   578   758   496   355                              0.0  54.6  17.7  503.8  679.8
  0   0.0   103.6         674    202    662    655    298    643    654                83   114     0     0     0     0                              3.0  46.8  15.2  431.8  582.7
K-1KIN=6400 LBS/HR     REGISTER POSITION=   43 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 589 F       WINDBOX P= 4.50IN H20     FURNACE P= 0.30IN H20     COAL P=10.00IN H20
MILL IN=  629 F   MILL OUT= 165 F   EXIT= 1589 F   EXIT(sp)= 1610 F   SMPL= 1209 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT 0   4   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 126   BASELINE SPREADER

 537 10:57:15  98.6 16365  2628      0   4446   3751      0   4673   4383   19881      2628 17253     0     0     0     0     0.16    1.21    1.21      3.8  45.0  15.2  380.0  560.0
                                                                                      159   569   676   848   449   308                              0.0  54.9  18.6  464.0  683.7
  0   0.0   106.1         638    212    665    658    310    643    655                87   113     0     0     0     0                              3.0  47.1  15.9  397.7  586.0
K-1KIN=6600 LBS/HR     REGISTER POSITION=   43 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 589 F       WINDBOX P= 4.50IN H20     FURNACE P= 0.30IN H20     COAL P=10.50IN H20
MILL IN=  602 F   MILL OUT= 156 F   EXIT= 1524 F   EXIT(sp)= 1400 F   SMPL= 1216 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT 0   5   ELAPSED TIME, MIN   9   RECORD ON TRK   0   FILE 127   REPEAT BASELINE

 559 11:09:13  98.2 16301  2667      0   4362   3877      0   4667   4230   19802      2667 17135     0     0     0     0     0.16    1.21    1.21      3.8  40.0  15.2  390.0  580.0
                                                                                      159   589   638   322   462   848                              0.0  48.8  18.6  476.2  708.1
  0   0.0   106.1         643    211    665    659    310    643    655                88   113     0     0     0     0                              3.0  41.9  15.9  408.1  607.0
K-1KIN=6600 LBS/HR     REGISTER POSITION=   50 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 589 F       WINDBOX P= 4.00IN H20     FURNACE P= 0.20IN H20     COAL P=10.50IN H20
MILL IN=  605 F   MILL OUT= 158 F   EXIT= 1466 F   EXIT(sp)= 1532 F   SMPL= 1192 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT 0   6   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE 128   REGISTER ADJUSTMENT

 579 11:18:34  99.1 16456  2625      0   4411   3763      0   4441   4416   19656      2625 17031     0     0     0     0     0.16    1.19    1.19      3.5  40.0  15.2  410.0  570.0
                                                                                      158   590   628   725   462   398                              0.0  48.0  18.2  492.0  684.0
  0   0.0   106.1         644    210    669    662    311    648    660                87   112     0     0     0     0                              3.0  41.1  15.6  421.7  586.3
K-1KIN=6600 LBS/HR     REGISTER POSITION=   35 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 590 F       WINDBOX P= 5.00IN H20     FURNACE P= 0.20IN H20     COAL P=10.50IN H20
MILL IN=  610 F   MILL OUT= 156 F   EXIT= 1514 F   EXIT(sp)= 1633 F   SMPL= 1214 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT 0   7   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 129   REGISTER ADJUSTMENT
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DATE        :    04-20-84                                          TER DIA      :   8
SYSTEM      :    LWS                                               SPREADER     :   4IN 4028
BURNER      :    CCV-100                                           B.P/R.H.     :   29.58/58.0
FUEL        :    UTAH9                                             OIL CHECK    :   -1.80
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              LOAD        PRIM   V -2   V -3   V -4   V -5   V -6   V -7   TOTAL     PRIM   SEC  TER1  TER2  TER3  TER4     PRIM   SEC   TOTAL      O2    CO    CO2    NO     SO2
PT#   TIME  MBTU/HR  TA                       FLOW SCFM                                       FLOW SCFM                          SR (CUM)                       MEASURED
 OIL          CALC  SCFM                                                                      TEMP (F)                                                  CORR TO 0% O2
(%)   LOAD    MEAS                            TEMP (F)                                   VELOCITY (FT/SEC)                                             CORR TO 3% O2
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 642  11:49:12  100.5 16680  2590      0   4110   3694      0   4489   3996   18880     2590 16290     0     0     0     0     0.16   1.13   1.13      2.5  47.0  16.2  365.0  600.0
                                                                                         157   592   474   774   560   351                           0.0  53.4  18.4  414.3  681.1
   0    0.0   106.1          651    207    675    667    310    650    665                85   107     0     0     0     0                           3.0  45.7  15.8  355.1  583.8
K-TKUN=6600 LBS/HR    REGISTER POSITION=   43 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 592 F     WINDBOX P= 3.40IN H2O    FURNACE P= 0.20IN H2O    COAL P= 9.50IN H2O
MILL IN=  616 F   MILL OUT= 156 F   EXIT= 1524 F   EXIT(sp)= 1607 F   SMPL= 1212 F          SORBENT LBS/HR=   0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #   8   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE 130   EXCESS AIR CURVE

 660  11:59:25   97.2 16139  2631      0   3802   3316      0   4121   3476   17346     2631 14715     0     0     0     0     0.16   1.07   1.07      1.5  80.0  19.0  240.0  700.0
                                                                                         159   597   654   767   499   334                           0.0  86.2  20.5  258.5  753.8
   0    0.0   106.1          645    209    609    679    310    664    675                87    97     0     0     0     0                           3.0  73.8  17.5  221.5  646.2
K-TKUN=6600 LBS/HR    REGISTER POSITION=   43 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 597 F     WINDBOX P= 3.40IN H2O    FURNACE P= 0.20IN H2O    COAL P= 9.50IN H2O
MILL IN=  611 F   MILL OUT= 150 F   EXIT= 1405 F   EXIT(sp)= 1611 F   SMPL= 1177 F          SORBENT LBS/HR=   0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #   9   ELAPSED TIME, MIN   2   RECORD ON TRK   0   FILE 131   SMOKE POINT

 666  12:04:37   96.3 15993  2530      0   4615   3940      0   4305   4963   20354     2530 17824     0     0     0     0     0.16   1.27   1.27      4.6  40.0  14.2  460.0  500.0
                                                                                         159   596   508   794   617   358                           0.0  51.2  18.2  589.8  640.2
   0    0.0   106.1          659    202    684    676    303    659    674                83   110     0     0     0     0                           3.0  43.9  15.6  504.9  548.8
K-TKUN=6600 LBS/HR    REGISTER POSITION=   43 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 598 F     WINDBOX P= 4.20IN H2O    FURNACE P= 0.20IN H2O    COAL P= 9.50IN H2O
MILL IN=  616 F   MILL OUT= 157 F   EXIT= 1407 F   EXIT(sp)= 1024 F   SMPL= 1220 F          SORBENT LBS/HR=   0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  10   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE 132   EXCESS AIR CURVE

 679  12:09:02   96.5 16028  2489      0   4854   4385      0   4609   5357   21694     2489 19205     0     0     0     0     0.16   1.35   1.35      5.6  35.0  13.2  485.0  460.0
                                                                                         159   595   468   821   711   346                           0.0  47.7  18.0  661.4  627.3
   0    0.0   106.1          663    200    675    667    301    650    669                82   127     0     0     0     0                           3.0  40.9  15.4  566.9  537.1
K-TKUN=6600 LBS/HR    REGISTER POSITION=   43 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 595 F     WINDBOX P= 5.00IN H2O    FURNACE P= 0.20IN H2O    COAL P= 9.50IN H2O
MILL IN=  619 F   MILL OUT= 158 F   EXIT= 1500 F   EXIT(sp)= 1352 F   SMPL= 1239 F          SORBENT LBS/HR=   0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  11   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE 133   MAX. EXCESS AIR

 740  12:34:26   99.2 16475  2474      0   4197   3707      0   4620   4791   19789     2474 17316     0     0     0     0     0.15   1.20   1.20      3.6  40.0  15.2  390.0  570.0
                                                                                         166   570   718   895   518   313                           0.0  48.3  18.3  470.7  687.9
   0    0.0   106.1          666    182    654    646    285    632    649                83   113     0     0     0     0                           3.0  41.4  15.7  403.4  589.7
K-TKUN=6600 LBS/HR    REGISTER POSITION=   43 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 578 F     WINDBOX P= 3.70IN H2O    FURNACE P= 0.20IN H2O    COAL P= 9.50IN H2O
MILL IN=  621 F   MILL OUT= 171 F   EXIT= 1534 F   EXIT(sp)= 1565 F   SMPL= 1237 F          SORBENT LBS/HR=   0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  12   ELAPSED TIME, MIN  10   RECORD ON TRK   0   FILE 134   BASELINE

 764  12:50:25   91.8 15247  2193      0   3996   3613      0   4498   4652   18953     2193 16759     0     0     0     0     0.14   1.24   1.24      4.2  40.0  14.8  420.0  300.0
                                                                                         162   564  1138   950   389   325                           0.0  50.0  18.5  525.0  375.0
   0    0.0   106.1          702    170    662    654    275    640    658                73   110     0     0     0     0                           3.0  42.9  15.9  450.0  321.4
K-TKUN=6600 LBS/HR    REGISTER POSITION=   43 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 584 F     WINDBOX P= 3.70IN H2O    FURNACE P= 0.20IN H2O    COAL P= 9.50IN H2O
MILL IN=  652 F   MILL OUT= 165 F   EXIT= 1535 F   EXIT(sp)= 1535 F   SMPL= 1232 F  SORBENT= VICRON     MILL INJECTION    SORBENT LBS/HR= 593    SORBENT VELOCITY=  73 FT/SEC   SORBENT AIR FLOW=  205  SCFM   (Ca)/(S)=  3.56
VALID DATA POINT #  13   ELAPSED TIME, MIN   7   RECORD ON TRK   0   FILE 135   LIMESTONE  INJECTION

 777  13:00:02   91.7 15224  2245      0   3961   3578      0   4501   4639   18924     2245 16679     0     0     0     0     0.15   1.24   1.24      4.2  35.0  14.4  380.0  520.0
                                                                                         159   585  1147   947   393   326                           0.0  43.8  18.0  475.0  650.0
   0    0.0   106.1          695    166    664    656    270    642    662                74   109     0     0     0     0                           3.0  37.5  15.4  407.1  557.1
K-TKUN=6600 LBS/HR    REGISTER POSITION=   43 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 585 F     WINDBOX P= 3.70IN H2O    FURNACE P= 0.20IN H2O    COAL P= 9.50IN H2O
MILL IN=  650 F   MILL OUT= 160 F   EXIT= 1502 F   EXIT(sp)= 1285 F   SMPL= 1218 F          SORBENT LBS/HR=   0    SORBENT VELOCITY=  74 FT/SEC   SORBENT AIR FLOW=    0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  14   ELAPSED TIME, MIN   4   RECORD ON TRK   0   FILE 136   BASELINE
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DATE                    :    04-20-84                    TER DIA          :    8
SYSTEM                  :    LWS                         SPREADER         :    4IN 4028
BURNER                  :    CCV-100                     B.P/R.H.         :    29.58/58.0
FUEL                    :    UTAH9                       OIL CHECK        :    -1.80
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             LOAD         PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL    PRIM   SEC  TER1  TER2  TER3  TER4    PRIM    SEC   TOTAL      O2    CO    CO2    NO    SO2
PT#   TIME  MBTU/HR  TA    \                  FLOW SCFM                                       FLOW SCFM                          SR (CUM)                      MEASURED
  OIL        CALC  SCFM     \                                                                  TEMP (F)                                                     CORR TO 0% O2
(%)   LOAD   MEAS                             TEMP (F)                                     VELOCITY (FT/SEC)                                                CORR TO 3% O2
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 799 13:10:21  89.3 14825  2339      0   3975   3546      0   4503   4617   18981    2339 16642     0     0     0     0    0.16    1.28    1.28      4.7   35.0  14.2  400.0  300.0
                                                                                      160   587  1055   920   418   317                             0.0   45.1  18.3  515.3  386.5
   0    0.0   106.1         679    158    668    659    267    645    665              77   109     0     0     0     0                             3.0   38.7  15.7  441.7  331.3
K-1KIN=8600 LBS/HR    REGISTER POSITION=  43 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 587 F    WINDBOX P= 3.70IN H20    FURNACE P= 0.20IN H20    COAL P= 9.50IN H20
MILL IN=  634 F   MILL OUT= 162 F   EXIT= 1496 F   EXIT(sp)= 1551 F   SMPL= 1217 F  SORBENT= VICRON    MILL INJECTION    SORBENT LBS/HR= 413    SORBENT VELOCITY=  77 FT/SEC   SORBENT AIR FLOW=  205  SCFM   [Ca]/[S]=  2.55
VALID DATA POINT #  15   ELAPSED TIME, MIN   6   RECORD ON TRK   0   FILE 137   LIMESTONE INJECTION

 805 13:19:53  95.1 15796  2380      0   3963   3537      0   4487   4606   18974    2380 16593     0     0     0     0    0.15    1.20    1.20      3.6   40.0  15.0  380.0  540.0
                                                                                      162   590   703   820   475   328                             0.0   48.3  18.1  458.6  651.7
   0    0.0   106.1         673    155    670    660    263    647    667              79   109     0     0     0     0                             3.0   41.4  15.5  393.1  558.6
K-1KIN=8600 LBS/HR    REGISTER POSITION=  43 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 590 F    WINDBOX P= 3.70IN H20    FURNACE P= 0.20IN H20    COAL P= 9.50IN H20
MILL IN=  627 F   MILL OUT= 162 F   EXIT= 1512 F   EXIT(sp)= 1502 F   SMPL= 1228 F            SORBENT LBS/HR=   0    SORBENT VELOCITY=  79 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  16   ELAPSED TIME, MIN   3   RECORD ON TRK   0   FILE 138   BASELINE

 825 13:26:15  92.5 15350  2264      0   3948   3543      0   4525   4582   18862    2264 16598     0     0     0     0    0.15    1.23    1.23      4.0   35.0  14.6  385.0  400.0
                                                                                      158   508  1166   955   388   334                             0.0   43.2  18.0  475.6  494.1
   0    0.0   106.1         693    151    670    662    262    646    668              75   109     0     0     0     0                             3.0   37.1  15.5  407.6  423.5
K-1KIN=8600 LBS/HR    REGISTER POSITION=  43 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 588 F    WINDBOX P= 3.70IN H20    FURNACE P= 0.20IN H20    COAL P= 9.50IN H20
MILL IN=  640 F   MILL OUT= 163 F   EXIT= 1530 F   EXIT(sp)= 1578 F   SMPL= 1232 F  SORBENT= VICRON    MILL INJECTION    SORBENT LBS/HR= 233    SORBENT VELOCITY=  75 FT/SEC   SORBENT AIR FLOW=  205  SCFM   [Ca]/[S]=  1.39
VALID DATA POINT #  17   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE   1   LIMESTONE INJECTION

 850 13:40:51  99.0 16441  2511      0   4072   3569      0   4497   4771   19421    2511 16910     0     0     0     0    0.15    1.18    1.18      3.3   40.0  15.2  380.0  560.0
                                                                                      162   592   632   863   559   333                             0.0   47.5  18.0  450.8  664.4
   0    0.0   106.1         664    145    674    666    260    651    669              83   111     0     0     0     0                             3.0   40.7  15.5  386.4  569.5
K-1KIN=8600 LBS/HR    REGISTER POSITION=  43 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 592 F    WINDBOX P= 3.60IN H20    FURNACE P= 0.20IN H20    COAL P=10.50IN H20
MILL IN=  624 F   MILL OUT= 165 F   EXIT= 1519 F   EXIT(sp)= 1304 F   SMPL= 1237 F            SORBENT LBS/HR=   0    SORBENT VELOCITY=  80 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  18   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE   2   BASELINE

 933 14:18:55  75.4 12526  2652      0   2956   2740      0   3692   3531   15570    2652 12918     0     0     0     0    0.21    1.24    1.24      4.2   35.0  14.4  310.0  520.0
                                                                                      145   597   768   625   445   310                             0.0   43.8  18.0  387.5  650.0
   0    0.0     8.1         313    146    687    676    261    665    687              86    86     0     0     0     0                             3.0   37.5  15.4  332.1  557.1
K-1KIN= 660 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 597 F    WINDBOX P= 4.00IN H20    FURNACE P= 0.10IN H20    COAL P=10.50IN H20
MILL IN=  280 F   MILL OUT= 136 F   EXIT= 1432 F   EXIT(sp)= 1481 F   SMPL= 1121 F            SORBENT LBS/HR=   0    SORBENT VELOCITY=  80 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  19   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE   3   DROPPING LOAD

1052 15:15:40  71.5 11860  2753      0   2656   2453      0   3340   3465   14667    2753 11914     0     0     0     0    0.23    1.24    1.24      4.1   50.0  14.6  225.0  550.0
                                                                                      148   642   930   502   418   340                             0.0   62.1  18.1  279.6  683.4
   0    0.0    72.0         411    135    771    756    245    737    766              89    82     0     0     0     0                             3.0   53.3  15.6  239.6  585.8
K-1KIN=5900 LBS/HR    REGISTER POSITION=  40 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 642 F    WINDBOX P= 3.00IN H20    FURNACE P= 0.01IN H20    COAL P= 9.00IN H20
MILL IN=  368 F   MILL OUT= 147 F   EXIT= 1317 F   EXIT(sp)= 1351 F   SMPL= 1066 F            SORBENT LBS/HR=   0    SORBENT VELOCITY=  80 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  20   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE   4   LOW LOAD

1081 15:33:50  65.6 10887  2588      0   2274   2098      0   3067.  2977   13004    2588 10416     0     0     0     0    0.24    1.19    1.19      3.5  100.0  15.4  210.0  600.0
                                                                                      151   662   495   149   597   536                             0.0  120.0  18.5  252.0  720.0
   0    0.0    72.8         424    138    806    788    250    775    803              84    73     0     0     0     0                             3.0  102.9  15.8  216.0  617.1
K-1KIN=5900 LBS/HR    REGISTER POSITION=  40 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 662 F    WINDBOX P= 3.00IN H20    FURNACE P= 0.01IN H20    COAL P= 9.00IN H20
MILL IN=  376 F   MILL OUT= 155 F   EXIT= 1298 F   EXIT(sp)= 1338 F   SMPL= 1019 F            SORBENT LBS/HR=   0    SORBENT VELOCITY=  80 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA.POINT #  21   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE   5   MIN. EXCESS AIR-CO KNEE
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DATE          :  04-20-84                          TER DIA       :  8
SYSTEM        :  LWS                               SPREADER      :  4IN 4@20
BURNER        :  CCV-100                           B.P/R.H.      :  29.58/58.0
FUEL          :  UTAH9                             OIL CHECK     :  -1.80
------------------------------------------------------------------------------------------------------------------------------------------------------
              LOAD         PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL      PRIM   SEC  TER1  TER2  TER3  TER4     PRIM    SEC    TOTAL      O2    CO    CO2    NO    SO2
PT#    TIME  MBTU/HR  TA                         FLOW SCFM                                       FLOW SCFM                          SR (CUM)                              MEASURED
  OIL          CALC  SCFM                                                                         TEMP (F)                                                           CORR TO 0% O2
(%)   LOAD     MEAS                              TEMP (F)                                    VELOCITY (FT/SEC)                                                       CORR TO 3% O2
------------------------------------------------------------------------------------------------------------------------------------------------------

1096  15:42:55  70.3  11677  2323      0   2930   2703      0   3160   3656   14773     2323  12450     0     0     0     0    0.20    1.27    1.27      4.5   50.0   14.4  220.0  560.0
                                                                                         152    706   993   517   413   353                              0.0   63.6   18.3  280.0  712.7
  0     0.0     72.0               439    137    826    813    244    793    826            76     91     0     0     0     0                              3.0   54.5   15.7  240.0  610.1
E-TRIM=5900 LBS/HR     REGISTER POSITION=  40 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 706 F      WINDBOX P= 3.00IN H2O     FURNACE P= 0.01IN H2O     COAL P= 9.00IN H2O
MILL IN=  300 F   MILL OUT= 152 F   EXIT= 1312 F   EXIT(sp)= 1333 F   SMPL= 1054 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=  00 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  22   ELAPSED TIME, MIN   4   RECORD ON TRK   1   FILE   6   EXCESS AIR CURVE

1097  15:43:45  64.3  10682  2375      0   2910   2687      0   3196   3757   14933     2375  12559     0     0     0     0    0.22    1.40    1.40      6.1   40.0   12.6  280.0  500.0
                                                                                         152    707   997   535   413   347                              0.0   56.4   17.8  394.6  704.7
  0     0.0     72.0               438    137    826    813    244    793    829            77     92     0     0     0     0                              3.0   48.3   15.2  330.3  604.1
E-TRIM=5900 LBS/HR     REGISTER POSITION=  40 DEG    SPREADER POSITION=  -6.0 IN    WINDBOX T= 707 F      WINDBOX P= 3.00IN H2O     FURNACE P= 0.01IN H2O     COAL P= 9.00IN H2O
MILL IN=  305 F   MILL OUT= 153 F   EXIT= 1291 F   EXIT(sp)= 1316 F   SMPL= 1052 F          SORBENT LBS/HR=  0     SORBENT VELOCITY=  00 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  22   ELAPSED TIME, MIN   4   RECORD ON TRK   1   FILE   7   MAX. EXCESS AIR
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DATE         :    04-24-84                                        TER DIA       :    8
SYSTEM       :    LWS                                             SPREADER      :    FLARE SPR
BURNER       :    FLARE 100                                       B.P/R.H.      :    29.34/55.0
FUEL         :    UTAH9                                           OIL CHECK     :    -1.57
--------------------------------------------------------------------------------------------------------------------------------------------------------------
            LOAD          PRIM   V-2    V-3    V-4    V-5    V-8    V-7    TOTAL     PRIM   SEC   TER1  TER2  TER3  TER4      PRIM    SEC      TOTAL       O2    CO    CO2    NO    SO2
PT0   TIME  MBTU/HR  TA                       FLOW SCFM                                        FLOW SCFM                            SR (CUM)                                MEASURED
  OIL        CALC  SCFM                                                                        TEMP (F)                                                             CORR TO 0% O2
(%)   LOAD   MEAS                             TEMP (F)                                    VELOCITY (FT/SEC)                                                         CORR TO 3% O2
--------------------------------------------------------------------------------------------------------------------------------------------------------------

 257 10:15:51 101.7 16882  2701      0  4549   4038      0   3817   4603  20508     2701 17807     0     0     0     0      0.16    1.21     1.21       3.8  40.0  14.0  480.0   0.0
                                                                                   165   509   592   134   481   291                                0.0  48.8  18.1  586.0   0.0
   0    0.0   99.9         593    193    669    659    287    644    658              99   117     0     0     0     0                                3.0  41.9  15.5  502.3   0.0
K-TRON=8100 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 589 F     WINDBOX P= 4.00IN H2O    FURNACE P= 0.15IN H2O    COAL P= 8.00IN H2O
MILL IN=  528 F  MILL OUT= 179 F   EXIT= 1532 F   EXIT(sp)= 1555 F   SMPL= 1221 F        SORBENT LBS/HR=  0     SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT 0   1  ELAPSED TIME, MIN  10  RECORD ON TRK   1   FILE   8  BASELINE

 327 10:44:10  99.3 16487  2675      0  4219   4668      0   3813   4653  20029     2675 17353     0     0     0     0      0.16    1.21     1.21       3.8  45.0  14.6  440.0 580.0
                                                                                   164   591  1038   132   376   322                                0.0  54.9  17.8  537.2 708.1
   0    0.0  102.4         591    198    675    670    297    650    668              98   114     0     0     0     0                                3.0  47.1  15.3  460.5 607.0
K-TRON=8300 LBS/HR    REGISTER POSITION=  40 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 591 F     WINDBOX P= 4.50IN H2O    FURNACE P= 0.25IN H2O    COAL P= 6.00IN H2O
MILL IN=  532 F  MILL OUT= 171 F   EXIT= 1491 F   EXIT(sp)= 1521 F   SMPL= 1214 F        SORBENT LBS/HR=  0     SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT 0   2  ELAPSED TIME, MIN  12  RECORD ON TRK   1   FILE   9  REGISTER ADJUSTMENT

 346 11:03:37 100.5 16694  2632      0  4227   4655      0   3615   4701  19030     2632 17198     0    -0     0     0      0.16    1.19     1.19       3.4  50.0  15.2  550.0 750.0
                                                                                   167   566  1302   139   421   361                                0.0  59.7  18.1  656.2 894.9
   0    0.0  102.4         593    200    670    664    299    644    665              96   113     0     0     0     0                                3.0  51.1  15.5  562.5 767.0
K-TRON=8300 LBS/HR    REGISTER POSITION=  30 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 586 F     WINDBOX P= 7.50IN H2O    FURNACE P= 0.25IN H2O    COAL P= 7.50IN H2O
MILL IN=  527 F  MILL OUT= 176 F   EXIT= $$$$ F   EXIT(so)= 1433 F   SMPL= 1179 F        SORBENT LBS/HR=  0     SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT 0   3  ELAPSED TIME, MIN   7  RECORD ON TRK   1   FILE  10  REGISTER ADJUSTMENT

 423 11:41:41 103.4 17166  2715      0  4112   4790      0   3983   4702  20390     2715 17675     0     0     0     0      0.16    1.19     1.19       3.4  45.0  15.2  545.0 590.0
                                                                                   159   582   493   137   561   319                                0.0  53.7  18.1  650.3 704.0
   0    0.0   97.4         580    194    663    659    295    638    657              98   115     0     0     0     0                                3.0  46.0  15.5  557.4 603.4
K-TRON=7900 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 582 F     WINDBOX P= 3.50IN H2O    FURNACE P= 0.20IN H2O    COAL P= 7.50IN H2O
MILL IN=  518 F  MILL OUT= 164 F   EXIT= $$$$ F   EXIT(so)= 1419 F   SMPL= 1246 F        SORBENT LBS/HR=  0     SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT 0   4  ELAPSED TIME, MIN   6  RECORD ON TRK   1   FILE  11  REGISTER ADJUSTMENT

 452 11:54:26 101.3 16824  2705      0  4133   4812      0   3993   4794  20437     2705 17732     0     0     0     0      0.16    1.21     1.21       3.0  45.0  14.0  565.0 580.0
                                                                                   162   581   470   102   533   337                                0.0  54.9  18.1  609.0 700.1
   0    0.0   97.4         581    193    661    658    292    636    658              98   116     0     0     0     0                                3.0  47.1  15.5  591.3 607.1
K-TRON=7900 LBS/HR    REGISTER POSITION=  55 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 581 F     WINDBOX P= 3.50IN H2O    FURNACE P= 0.20IN H2O    COAL P= 5.50IN H2O
MILL IN=  523 F  MILL OUT= 160 F   EXIT= $$$$ F   EXIT(so)= 1504 F   SMPL= 1243 F        SORBENT LBS/HR=  0     SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT 0   5  ELAPSED TIME, MIN   7  RECORD ON TRK   1   FILE  12  REGISTER ADJUSTMENT

 473 12:07:39 102.9 17002  2763      0  4111   4759      0   4005   4766  20403     2763 17640     0     0     0     0      0.16    1.19     1.19       3.5  43.0  15.0  580.0 560.0
                                                                                   161   581   593   136   508   357                                0.0  51.6  18.0  696.0 672.0
   0    0.0   97.4         572    191    661    656    291    638    654             100   115     0     0     0     0                                3.0  44.2  15.4  596.6 576.0
K-TRON=7900 LBS/HR    REGISTER POSITION=  63 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 581 F     WINDBOX P= 3.50IN H2O    FURNACE P= 0.20IN H2O    COAL P= 5.50IN H2O
MILL IN=  514 F  MILL OUT= 171 F   EXIT= $$$$ F   EXIT(so)= 1486 F   SMPL= 1230 F        SORBENT LBS/HR=  0     SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM  [Ca]/[S]=  0.00
VALID DATA POINT 0   6  ELAPSED TIME, MIN   6  RECORD ON TRK   1   FILE  13  REGISTER ADJUSTMENT
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DATE                :  04-24-84                      TER DIA       :  8
SYSTEM              :  LWS                           SPREADER      :  FLARE SPR
BURNER              :  FLARE 100                     R.P/R.H.      :  29.34/55.0
FUEL                :  UTAH8                         OIL CHECK     :  -1.57
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               LOAD        PRIN   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL    PRIN  SEC  TER1 TER2 TER3 TER4    PRIN    SEC    TOTAL     O2   CO    CO2   NO    SO2
PT#   TIME   MBTU/HR  TA                       FLOW SCFM                                    FLOW SCFM                      SR (CUM)                          MEASURED
  OIL          CALC  SCFM                                                                   TEMP (F)                                                      CORR TO 0% O2
(%)   LOAD     MEAS                            TEMP (F)                                 VELOCITY (FT/SEC)                                                 CORR TO 3% O2
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 507  12:24:21  103.3  17266  2811     0   4089   4754     0   3976   4763   20393    2811 17582    0    0    0    0    0.16    1.10    1.10     3.3  40.0  15.2  500.0  590.0
                                                                                     162   585  541  137  496  462                              0.0  47.5  18.0  600.1  700.0
   0    0.0      90.1         569    193    665    659    292    641    657           102   115    0    0    0    0                              3.0  40.7  15.5  509.0  600.0
K-1KUN=7900 LBS/HR    REGISTER POSITION=  55 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 585 F   WINDBOX P= 3.50IN H2O   FURNACE P= 0.10IN H2O   COAL P= 6.00IN H2O
MILL IN=  512 F   MILL OUT= 160 F   EXIT= #### F   EXIT(sp)= 1523 F   SMPL= 1240 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #   7   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  42   BASELINE-EXCESS AIR CURVE

 525  12:33:56  100.6  16828  2791     0   3737   4303     0   3825   4182   18838    2791 16047    0    0    0    0    0.17    1.12    1.12     2.3  40.0  16.2  515.0  600.0
                                                                                     162   582  527  201  478  548                              0.0  44.9  18.2  570.3  673.0
   0    0.0      90.1         568    194    660    662    294    643    660           101   105    0    0    0    0                              3.0  38.5  15.6  495.7  577.5
K-1KUN=7900 LBS/HR    REGISTER POSITION=  55 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 582 F   WINDBOX P= 2.00IN H2O   FURNACE P= 0.10IN H2O   COAL P= 6.00IN H2O
MILL IN=  510 F   MILL OUT= 166 F   EXIT= #### F   EXIT(sp)= 1262 F   SMPL= 1229 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #   8   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  43   EXCESS AIR CURVE

 541  12:42:52  103.0  17221  2760     0   3522   4163     0   3680   3925   18050    2760 15290    0    0    0    0    0.16    1.05    1.05     1.0  65.0  17.8  400.0  740.0
                                                                                     163   580  601  144  460  690                              0.0  68.3  18.7  420.0  777.0
   0    0.0      90.1         563    197.   679    674    295    650    671           100   100    0    0    0    0                              3.0  58.5  16.0  360.0  666.1
K-1KUN=7900 LBS/HR    REGISTER POSITION=  55 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 580 F   WINDBOX P= 2.00IN H2O   FURNACE P= 0.10IN H2O   COAL P= 6.00IN H2O
MILL IN=  510 F   MILL OUT= 171 F   EXIT= #### F   EXIT(sp)= 1547 F   SMPL= 1205 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #   9   ELAPSED TIME, MIN   2   RECORD ON TRK   1   FILE  44   MIN. EXCESS AIR

 548  12:48:03  102.2  17089  2791     0   4567   5074     0   3937   5247   21617    2791 18826    0    0    0    0    0.16    1.26    1.26     4.5  40.0  14.2  590.0  520.0
                                                                                     163   592  629  168  479  537                              0.0  50.9  18.1  750.9  661.0
   0    0.0      90.1         563    194    674    670    292    650    668           101   124    0    0    0    0                              3.0  43.6  15.5  643.6  567.3
K-1KUN=7900 LBS/HR    REGISTER POSITION=  55 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 592 F   WINDBOX P= 4.00IN H2O   FURNACE P= 0.10IN H2O   COAL P= 6.00IN H2O
MILL IN=  504 F   MILL OUT= 167 F   EXIT= #### F   EXIT(sp)= 1522 F   SMPL= 1262 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  10   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  45   EXCESS AIR CURVE

 558  12:53:11  101.8  17018  2767     0   4819   5290     0   4222   5500   22598    2767 19831    0    0    0    0    0.16    1.33    1.33     5.3  35.0  13.4  610.0  400.0
                                                                                     161   584  598  136  484  495                              0.0  46.8  17.9  815.9  642.0
   0    0.0      90.1         566    192    660    656    290    638    654           100   130    0    0    0    0                              3.0  40.1  15.4  699.4  550.1
K-1KUN=7900 LBS/HR    REGISTER POSITION=  55 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 584 F   WINDBOX P= 4.40IN H2O   FURNACE P= 0.10IN H2O   COAL P= 6.00IN H2O
MILL IN=  505 F   MILL OUT= 167 F   EXIT= #### F   EXIT(sp)= 1409 F   SMPL= 1269 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  11   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  46   HIGH EXCESS AIR

 691  13:51:46  101.1  16899  2666     0   4045   4639     0   4146   4686   20182    2665 17516    0    0    0    0    0.16    1.19    1.19     3.5  35.0  15.0  575.0  540.0
                                                                                     160   578  571  156  497  560                              0.0  42.0  18.0  690.0  640.0
   0    0.0      90.1         584    189    660    655    207    633    653            97   114    0    0    0    0                              3.0  36.0  15.4  591.4  555.4
K-1KUN=7900 LBS/HR    REGISTER POSITION=  55 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 578 F   WINDBOX P= 4.40IN H2O   FURNACE P= 0.10IN H2O   COAL P= 6.00IN H2O
MILL IN=  522 F   MILL OUT= 166 F   EXIT= #### F   EXIT(sp)= 1527 F   SMPL= 1259 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=   0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  12   ELAPSED TIME, MIN   9   RECORD ON TRK   1   FILE  47   BASELINE

 722  14:07:26   96.2  16091  2520     0   4029   4597     0   4147   4706   19999    2520 17479    0    0    0    0    0.16    1.24    1.24     4.2  35.0  14.4  630.0  320.0
                                                                                     159   579  603  137  496  580                              0.0  43.8  18.0  787.5  400.0
   0    0.0      90.1         608    186    658    654    204    635    655            91   114    0    0    0    0                              3.0  37.5  15.4  675.0  342.9
K-1KUN=7900 LBS/HR    REGISTER POSITION=  55 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 579 F   WINDBOX P= 3.40IN H2O   FURNACE P=-0.10IN H2O   COAL P= 5.50IN H2O
MILL IN=  542 F   MILL OUT= 166 F   EXIT= #### F   EXIT(sp)= 1593 F   SMPL= 1331 F   SORBENT= VICRON   MILL INJECTION   SORBENT LBS/HR= 584   SORBENT VELOCITY=  91 FT/SEC   SORBENT AIR FLOW=  223  SCFM   [Ca]/[S]=  3.36
VALID DATA POINT #  13   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  48  JR
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DATE          :  04-24-84                              TER DIA       :  8
SYSTEM        :  LWS                                   SPREADER      :  FLARE SPR
BURNER        :  FLARE 100                             B.P/R.H.      :  29.34/55.0
FUEL          :  UTAH8                                 OIL CHECK     :  -1.57

                 LOAD       PRIN   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL     PRIN   SEC  TER1  TER2  TER3  TER4      PRIN     SEC     TOTAL          O2    CO    CO2    NO     SO2
PT#     TIME   MBTU/HR  TA                      FLOW SCFM                                            FLOW SCFM                      SR (CUM)                                     MEASURED
  OIL                CALC  SCFM                                                                      TEMP (F)                                                              CORR TO 0% O2
(%)    LOAD         MEAS                        TEMP (F)                                          VELOCITY (FT/SEC)                                                         CORR TO 3% O2

 769  14:32:32  101.3  16937  2457      0   4256   4660      0   4133   4950   20456     2457  17999    0     0     0     0       0.15     1.21     1.21         3.7   35.0  14.8  640.0  380.0
                                                                                          156    579  580   126   536   530                                     0.0   42.5  18.0  776.9  461.3
   0     0.0    90.1          615    103    658    655    200    636    656               88    117    0     0     0     0                                     3.0   36.4  15.4  665.9  395.1
K-1RUN=7900 LBS/HR     REGISTER POSITION=  55 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 579 F     WINDBOX P= 3.40IN H2O    FURNACE P=-0.10IN H2O    COAL P= 5.50IN H2O
MILL IN=  549 F   MILL OUT= 161 F   EXIT= 0000 F   EXIT(sp)= 1569 F   SMPL= 1306 F  SORBENT= VICRON      MILL INJECTION   SORBENT LBS/HR= 400    SORBENT VELOCITY=  88 FT/SEC   SORBENT AIR FLOW=  223  SCFM   [Ca]/[S]=  2.19
VALID DATA POINT # 14   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  49   LIMESTONE INJECTION

 891  15:34:40  101.6  16904  2723      0   4194   4616      0   4162   4935   20630     2723  17907    0     0     0     0       0.16     1.21     1.21         3.8   35.0  14.6  610.0  530.0
                                                                                          162    578  503   137   501   524                                     0.0   42.7  17.8  744.0  647.1
   0     0.0    90.1          577    103    657    653    270    634    652               99    117    0     0     0     0                                     3.0   36.6  15.3  638.4  554.7
K-1RUN=7900 LBS/HR     REGISTER POSITION=  55 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 570 F     WINDBOX P= 3.40IN H2O    FURNACE P=-0.10IN H2O    COAL P= 5.50IN H2O
MILL IN=  516 F   MILL OUT= 167 F   EXIT= 0000 F   EXIT(sp)= 1540 F   SMPL= 1293 F          SORBENT LBS/HR=   0    SORBENT VELOCITY=  97 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT # 15   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  50   BASELINE

 919  15:50:40  102.1  17075  2535      0   4209   4680      0   4144   4939   20506     2535  17972    0     0     0     0       0.15     1.20     1.20         3.6   35.0  14.8  640.0  470.0
                                                                                          160    581  540   140   571   529                                     0.0   42.2  17.9  772.4  567.2
   0     0.0    90.1          599    101    659    655    270    637    654               92    117    0     0     0     0                                     3.0   36.2  15.3  662.1  406.2
K-1RUN=7900 LBS/HR     REGISTER POSITION=  55 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 581 F     WINDBOX P= 3.40IN H2O    FURNACE P=-0.10IN H2O    COAL P= 5.50IN H2O
MILL IN=  530 F   MILL OUT= 169 F   EXIT= 0000 F   EXIT(sp)= 1592 F   SMPL= 1304 F  SORBENT= VICRON      MILL INJECTION   SORBENT LBS/HR= 227    SORBENT VELOCITY=  92 FT/SEC   SORBENT AIR FLOW=  223  SCFM   [Ca]/[S]=  1.23
VALID DATA POINT # 16   ELAPSED TIME, MIN   0   RECORD ON TRK   1   FILE  51   LIMESTONE INJECTION

 993  16:19:57  102.9  17200  2612      0   4090   4790      0   4194   5087   20774     2612  18162    0     0     0     0       0.15     1.21     1.21         3.7   35.0  14.8  620.0  530.0
                                                                                          162    585  542   130   581   531                                     0.0   42.5  18.0  752.6  643.4
   0     0.0    90.1          566    106    661    657    280    641    656               95    119    0     0     0     0                                     3.0   36.4  15.4  645.1  551.4
K-1RUN=7900 LBS/HR     REGISTER POSITION=  55 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 585 F     WINDBOX P= 3.50IN H2O    FURNACE P= 0.25IN H2O    COAL P= 6.00IN H2O
MILL IN=  507 F   MILL OUT= 175 F   EXIT= 0000 F   EXIT(sp)= 1572 F   SMPL= 1302 F          SORBENT LBS/HR=   0    SORBENT VELOCITY= 101 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT # 17   ELAPSED TIME, MIN  15   RECORD ON TRK   1   FILE  52   SO2 WET TEST-BASELINE CONDITION
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DATE          :   04-25-84                     TER DIA      :   8
SYSTEM        :   LWS                          SPREADER     :   FLARE SPR
BURNER        :   FLARE 100                    B.P/R.H.     :   29.45/47.0
FUEL          :   ILLINOIS3                    OIL CHECK    :   0.45
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              LOAD          PRIN   V -2   V -3   V -4   V -5   V -6   V -7   TOTAL    PRIN   SEC  TER1 TER2 TER3 TER4    PRIN   SEC   TOTAL      O2    CO   CO2    NO    SO2
PT#    TIME  MBTU/HR  TA                         FLOW SCFM                                      FLOW SCFM                          SR (CUM)                             MEASURED
  OIL         CALC  SCFM                                                                        TEMP (F)                                                            CORR TO 0% O2
(%)   LOAD    MEAS                               TEMP (F)                                   VELOCITY (FT/SEC)                                                      CORR TO 3% O2
----------------------------------------------------------------------------------------------------------------------------------

 299  09:30:01  102.9  16689  2522    0   3403   4611     0   4166   4959  19642    2522 17120    0    0    0    0    0.15   1.10   1.10       3.2  40.0  16.0  580.0 2680.0
                                                                                   152   601  505  137  464  289                             0.0  47.2  18.9  604.3 3161.8
  0     0.0    92.6         876    107    601    677    296    657    675            90   114    0    0    0    0                             3.0  40.4  16.2  586.5 2710.1
K-1KUN=9200 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 601 F    WINDBOX P= 3.50IN H2O   FURNACE P= 0.15IN H2O   COAL P= 7.00IN H2O
MILL IN=  799 F   MILL OUT= 145 F   EXIT= 1589 F   EXIT(sp)= 1734 F   SMPL= 1226 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  1   ELAPSED TIME, MIN   0   RECORD ON TRK   1   FILE  25   BASELINE-EXCESS AIR

 300  09:46:46   99.9  16195  2511    0   3763   4071     0   4149   5004  20299    2511 17780    0    0    0    0    0.16   1.25   1.25       4.3  35.0  14.0  555.0 2440.0
                                                                                   154   599  467  126  500  289                             0.0  44.0  18.6  697.9 3060.3
  0     0.0    92.6         870    107    677    673    297    649    670            90   110    0    0    0    0                             3.0  37.7  16.0  590.2 2629.9
K-1KUN=9200 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 599 F    WINDBOX P= 4.00IN H2O   FURNACE P= 0.25IN H2O   COAL P= 7.00IN H2O
MILL IN=  797 F   MILL OUT= 154 F   EXIT= 1556 F   EXIT(sp)= 1692 F   SMPL= 1221 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  2   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  26   EXCESS AIR CURVE

 325  09:57:02   99.1  16072  2540    0   4010   5028     0   4410   5400  21412    2540 18064    0    0    0    0    0.16   1.33   1.33       5.3  33.0  13.0  500.0 2200.0
                                                                                   152   590  497  137  505  207                             0.0  44.1  18.5  775.0 3049.7
  0     0.0    92.6         785    103    661    658    293    640    658            91   124    0    0    0    0                             3.0  37.0  15.0  665.0 2614.0
K-1RUN=9200 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 590 F    WINDBOX P= 4.00IN H2O   FURNACE P= 0.25IN H2O   COAL P= 7.00IN H2O
MILL IN=  714 F   MILL OUT= 146 F   EXIT= 1552 F   EXIT(sp)= 1682 F   SMPL= 1234 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  3   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  27   EXCESS AIR CURVE

 346  10:09:51  100.7  16331  2510    0   3120   4232     0   4239   4296  18404    2510 15087    0    0    0    0    0.15   1.13   1.13       2.4  50.0  16.6  460.0 2040.0
                                                                                   155   569  540  134  474  300                             0.0  56.5  18.7  519.4 3206.5
  0     0.0    92.6         824    101    665    665    292    644    663            90   104    0    0    0    0                             3.0  48.4  16.1  445.2 2740.0
K-1KUN=9200 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 589 F    WINDBOX P= 3.00IN H2O   FURNACE P= 0.25IN H2O   COAL P= 7.00IN H2O
MILL IN=  749 F   MILL OUT= 140 F   EXIT= 1552 F   EXIT(sp)= 1698 F   SMPL= 1205 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  4   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  29   EXCESS AIR CURVE

 357  10:17:14  100.3  16260  2520    0   2942   4074     0   4116   4011  17670    2528 15142    0    0    0    0    0.16   1.09   1.09       1.7  70.0  17.8  430.0 2960.0
                                                                                   155   591  612  119  466  309                             0.0  76.2  19.4  467.9 3220.7
  0     0.0    92.6         823    179    672    670    290    651    660            91   100    0    0    0    0                             3.0  65.3  16.6  401.0 2760.6
K-1KUN=9200 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 591 F    WINDBOX P= 3.00IN H2O   FURNACE P= 0.25IN H2O   COAL P= 7.00IN H2O
MILL IN=  749 F   MILL OUT= 156 F   EXIT= 1581 F   EXIT(so)= 1725 F   SMPL= 1204 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  5   ELAPSED TIME, MIN   3   RECORD ON TRK   1   FILE  30   MIN. EXCESS AIR

 434  10:49:39  100.1  16227  2489    0   3411   4657     0   4298   4901  19756    2489 17267    0    0    0    0    0.15   1.22   1.22       3.0  35.0  15.0  550.0 2500.0
                                                                                   157   580  513  134  513  302                             0.0  42.7  18.3  671.5 3052.3
  0     0.0    92.6         806    159    651    649    270    632    652            90   112    0    0    0    0                             3.0  36.6  15.7  575.6 2616.[illegible]
K-1KUN=9200 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 580 F    WINDBOX P= 3.50IN H2O   FURNACE P= 0.25IN H2O   COAL P= 7.00IN H2O
MILL IN=  738 F   MILL OUT= 157 F   EXIT= 1553 F   EXIT(so)= 1587 F   SMPL= 1224 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  6   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  31   BASELINE

 511  11:23:49   98.3  15941  2359    0   3273   4540     0   4206   4720  19187    2359 16820    0    0    0    0    0.15   1.20   1.20       3.6  35.0  15.4  615.0 1660.0
                                                                                   156   582  595  130  406  296                             0.0  42.2  18.6  742.2 2003.4
  0     0.0    92.6         817    140    654    652    259    635    656            85   110    0    0    0    0                             3.0  36.2  15.9  636.2 1717.2
K-1KUN=9200 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 582 F    WINDBOX P= 3.50IN H2O   FURNACE P= 0.25IN H2O   COAL P= 7.00IN H2O
MILL IN=  750 F   MILL OUT= 156 F   EXIT= 1564 F   EXIT(so)=  433 F   SMPL= 1247 F  SORBENT= VICRON    MILL INJECTION   SORBENT LBS/HR=1452   SORBENT VELOCITY=  85 FT/SEC   SORBENT AIR FLOW=  219  SCFM   [Ca]/[S]=  2.16
VALID DATA POINT #  7   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  32   LIMESTONE INJECTION
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DATE          :   04-25-84                          TER DIA       :   8
SYSTEM        :   LWS                               SPREADER      :   FLARE SPR
BURNER        :   FLARE 100                         B.P/R.H.      :   29.45/47.0
FUEL          :   ILLINOIS3                         OIL CHECK     :   0.45
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          LOAD          PRIM   V -2   V -3   V -4   V -5   V -6   V -7   TOTAL     PRIM   SEC  TER1  TER2  TER3  TER4    PRIM   SEC    TOTAL      O2    CO   CO2    NO    SO2
PT#  TIME  MBTU/HR  TA                      FLOW SCFM                                     FLOW SCFM                           SR (CUM)                           MEASURED
  OIL       CALC  SCFM                                                                    TEMP (F)                                                           CORR TO 0% O2
(%)  LOAD   MEAS                            TEMP (F)                                  VELOCITY (FT/SEC)                                                      CORR TO 3% O2
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552  11:40:56  101.3  16424  2330    0   3365   4635     0   4321   4895   19546     2330 17216     0     0     0     0    0.14   1.19   1.19      3.4  35.0  15.6  630.0 1920.0
                                                                                      155   582   572   128   505   310                              0.0  41.8  18.6  751.7 2290.9
  0    0.0   92.6          850    144    651    650    253    633    654               84   112     0     0     0     0                              3.0  35.8  16.0  644.3 1963.6
K-TRIM=9200 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 582 F    WINDBOX P= 3.50IN H2O   FURNACE P= 0.25IN H2O   COAL P= 7.00IN H2O
MILL IN=  795 F   MILL OUT= 152 F   EXIT= 1581 F   EXIT(sp)= 1537 F   SMPL= 1273 F   SORBENT= VICRON    MILL INJECTION   SORBENT LBS/HR= 946   SORBENT VELOCITY=  84 FT/SEC   SORBENT AIR FLOW=  219  SCFM   [Ca]/[S]=  1.49
VALID DATA POINT #  8   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  33   LIMESTONE INJECTION

623  12:24:52   95.1  15422  2365    0   3473   4247     0   4338   4461   18884     2365 16519     0     0     0     0    0.15   1.22   1.22      3.9  33.0  14.8  570.0 2520.0
                                                                                      156   578   497   120   559   324                              0.0  40.5  18.2  700.0 3094.7
  0    0.0   92.6          907    140    650    648    249    632    651               85   107     0     0     0     0                              3.0  34.7  15.6  600.0 2652.6
K-TRIM=9200 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 578 F    WINDBOX P= 3.50IN H2O   FURNACE P= 0.25IN H2O   COAL P= 7.00IN H2O
MILL IN=  825 F   MILL OUT= 152 F   EXIT= 1526 F   EXIT(sp)= 1475 F   SMPL= 1226 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=  96 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  9   ELAPSED TIME, MIN   6   RECORD ON TRK   1   FILE  34   BASELINE

647  12:34:06   95.1  15423  2321    0   3310   4292     0   4340   4407   18670     2321 16349     0     0     0     0    0.15   1.21   1.21      3.7  33.0  15.2  610.0 2120.0
                                                                                      156   582   573   129   511   319                              0.0  40.1  18.5  740.5 2573.4
  0    0.0   92.6          922    141    656    654    250    639    658               84   107     0     0     0     0                              3.0  34.3  15.8  634.7 2205.0
K-TRIM=9200 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 582 F    WINDBOX P= 3.50IN H2O   FURNACE P= 0.25IN H2O   COAL P= 7.00IN H2O
MILL IN=  847 F   MILL OUT= 158 F   EXIT= 1547 F   EXIT(sp)= 1605 F   SMPL= 1246 F   SORBENT= VICRON    MILL INJECTION   SORBENT LBS/HR= 555   SORBENT VELOCITY=  84 FT/SEC   SORBENT AIR FLOW=  219  SCFM   [Ca]/[S]=  0.80
VALID DATA POINT #  10   ELAPSED TIME, MIN   8   RECORD ON TRK   1   FILE  36   LIMESTONE INJECTION

654  12:45:19   97.2  15763  2382    0   3390   4415     0   4337   4557   19081     2382 16699     0     0     0     0    0.15   1.21   1.21      3.7  30.0  15.0  600.0 2600.0
                                                                                      157   582   533   110   576   303                              0.0  36.4  18.2  720.3 3156.1
  0    0.0   92.6          910    140    656    653    250    638    658               86   109     0     0     0     0                              3.0  31.2  15.6  624.3 2705.2
K-TRIM=9200 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 582 F    WINDBOX P= 3.50IN H2O   FURNACE P= 0.25IN H2O   COAL P= 7.00IN H2O
MILL IN=  831 F   MILL OUT= 158 F   EXIT= 1535 F   EXIT(sp)= 1584 F   SMPL= 1230 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=  86 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  11   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  37   BASELINE

707  13:00:24   97.3  15774  2400    0   3403   4508     0   4339   4690   19427     2400 17019     0     0     0     0    0.15   1.23   1.23      4.0  35.0  15.0  610.0 2640.0
                                                                                      158   583   503   130   561   316                              0.0  43.2  18.5  753.5 3261.2
  0    0.0   92.6          904    139    652    650    246    636    653               87   111     0     0     0     0                              3.0  37.1  15.9  645.9 2795.5
K-TRIM=9200 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 583 F    WINDBOX P= 3.50IN H2O   FURNACE P= 0.25IN H2O   COAL P= 7.00IN H2O
MILL IN=  826 F   MILL OUT= 154 F   EXIT= 1526 F   EXIT(sp)= 1565 F   SMPL= 1240 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=  86 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  12   ELAPSED TIME, MIN  15   RECORD ON TRK   1   FILE  38   BASELINE-WET SO2 TEST

802  13:46:50   95.3  15444  2378    0   3463   4441     0   4343   4508   19132     2378 16754     0     0     0     0    0.15   1.24   1.24      4.1  35.0  15.0  590.0 2600.0
                                                                                      156   582   546   133   529   310                              0.0  43.5  18.6  733.1 3230.8
  0    0.0   92.6          873    136    656    652    246    637    656               86   109     0     0     0     0                              3.0  37.3  16.0  628.4 2769.2
K-TRIM=9200 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 582 F    WINDBOX P= 3.50IN H2O   FURNACE P= 0.25IN H2O   COAL P= 7.00IN H2O
MILL IN=  796 F   MILL OUT= 149 F   EXIT= 1532 F   EXIT(sp)= 1545 F   SMPL= 8888 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=  86 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  13   ELAPSED TIME, MIN  15   RECORD ON TRK   1   FILE  39   BASELINE-SO2 WET TEST

828  14:04:39   97.0  15859  2493    0   3457   4418     0   4336   4493   19197     2493 16704     0     0     0     0    0.16   1.21   1.21      3.7  35.0  15.4  630.0 2800.0
                                                                                      157   580   550   139   542   319                              0.0  42.5  18.7  764.7 3398.8
  0    0.0   92.6          843    137    656    650    245    636    656               90   109     0     0     0     0                              3.0  36.4  16.0  655.5 2913.3
K-TRIM=9200 LBS/HR    REGISTER POSITION=  47 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 580 F    WINDBOX P= 3.50IN H2O   FURNACE P= 0.25IN H2O   COAL P= 7.00IN H2O
MILL IN=  781 F   MILL OUT= 155 F   EXIT= 1535 F   EXIT(sp)= 1465 F   SMPL= 1240 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=  86 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  14   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  40   BASELINE
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DATE       :    04-25-84                        TER DIA       :   8
SYSTEM     :    LWS                             SPREADER      :   FLARE SPR
BURNER     :    FLARE 100                       B.P/R.H.      :   29.45/47.0
FUEL       :    ILLINOIS3                       OIL CHECK     :   0.45

                 LOAD          PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL    PRIM   SEC   TER1  TER2  TER3  TER4    PRIM    SEC    TOTAL      O2    CO    CO2    NO    SO2
PT#    TIME    MBTU/HR  TA                        FLOW SCFM                                        FLOW SCFM                          SR (CUM)                          MEASURED
  OIL            CALC  SCFM                                                                         TEMP (F)                                                        CORR TO 0% O2
(%)    LOAD      MEAS                              TEMP (F)                                    VELOCITY (FT/SEC)                                                    CORR TO 3% O2

 865  14:25:09   79.4  12869  2422     0   2626   3547     0   3702   3192   15490    2422  13068     0     0     0     0    0.19    1.20    1.20      3.6   40.0   15.2  480.0 2800.0
                                                                                      157    592   546   130   470   319                              0.0   48.3   18.3  579.3 3379.3
  0     0.0      80.5          813   141    683    677   252    662    679             87     86     0     0     0     0                              3.0   41.4   15.7  496.6 2896.6
E-1kWH=0000 LBS/HR    REGISTER POSITION=   47 DEG    SPREADER POSITION=   0.0 IN    WINDBOX T= 592 F       WINDBOX P= 2.00IN H2O    FURNACE P= 0.20IN H2O    COAL P= 7.00IN H2O
MILL IN=  727 F   MILL OUT= 140 F   EXIT= 1440 F   EXIT(sp)= 1434 F   SMPL= 1157 F           SORBENT LBS/HR=   0     SORBENT VELOCITY=  86 FT/SEC   SORBENT AIR FLOW=    0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  15   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  41   REDUCED LOAD
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DATE          :   05-04-84                                  TER DIA      :   0
SYSTEM        :   LWS                                       SPREADER     :   FLARE SPR
BURNER        :   FLARE 50                                  D.P/R.H.     :   29.51/74
FUEL          :   UTAH8                                     OIL CHECK    :   -5.3
------------------------------------------------------------------------------------------------------------------------------------------------------------
             LOAD        PRIM   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL    PRIM   SEC  TER1  TER2  TER3  TER4     PRIM    SEC     TOTAL      O2   CO   CO2   NO    SO2
PT#   TIME  MBTU/HR  TA                       FLOW SCFM                                      FLOW SCFM                            SR (CUM)                         MEASURED
 OIL          CALC  SCFM                                                                     TEMP (F)                                                         CORR TO 0% O2
(%)   LOAD    MEAS                            TEMP (F)                               VELOCITY (FT/SEC)                                                    CORR TO 3% O2
------------------------------------------------------------------------------------------------------------------------------------------------------------

 289  16:05:14  44.8  7496  1314      0      0      0      0   3731   4326   9371    1314  8057     0     0     0     0     0.10    1.25     1.25       4.3  50.0  15.6  440.0   0.0
                                                                                      147   620     0     0     0     0                                 0.0  62.9  19.6  553.3   0.0
   0    0.0     46.8         542    184    389    347    278    742    767            86   117     0     0     0     0                                 3.0  53.9  16.0  474.3   0.1
K-1K(W)=4100 LBS/HR    REGISTER POSITION=  45 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 620 F    WINDBOX P=12.00IN H20   FURNACE P= 0.01IN H20   COAL P=11.20IN H20
MILL IN=  311 F   MILL OUT= 152 F   EXIT= 1135 F   EXIT(so)= 1051 F   SMPL=  829 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #   1   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  53   FLARE BURNER-BASELINE

 330  16:25:02  43.5  7270  1363      0      0      0      0   3533   3944   8840    1363  7477     0     0     0     0     0.19    1.21     1.21       3.0  50.0  15.8  490.0   0.0
                                                                                      147   672     0     0     0     0                                 0.0  61.0  19.3  598.3   0.0
   0    0.0     46.8         534    192    415    364    292    812    841            89   114     0     0     0     0                                 3.0  52.3  16.5  512.0   0.1
K-1K(W)=4100 LBS/HR    REGISTER POSITION=  45 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 672 F    WINDBOX P=12.00IN H20   FURNACE P= 0.01IN H20   COAL P=11.20IN H20
MILL IN=  311 F   MILL OUT= 151 F   EXIT= 1134 F   EXIT(so)= 1067 F   SMPL=  830 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #   2   ELAPSED TIME, MIN   3   RECORD ON TRK   1   FILE  55   EXCESS AIR CURVE

 356  16:38:08  37.9  6342  1376      0      0      0      0   3544   4122   9042    1376  7666     0     0     0     0     0.22    1.43     1.43       6.4  45.0  13.6  420.0   0.0
                                                                                      147   704     0     0     0     0                                 0.0  64.7  19.6  604.1   0.0
   0    0.0     46.8         538    197    432    378    302    847    879            90   120     0     0     0     0                                 3.0  55.5  16.8  517.8   0.0
K-1K(W)=4100 LBS/HR    REGISTER POSITION=  45 DEG   SPREADER POSITION=  0.0 IN   WINDBOX T= 704 F    WINDBOX P=12.00IN H20   FURNACE P= 0.01IN H20   COAL P=11.20IN H20
MILL IN=  334 F   MILL OUT= 151 F   EXIT= 1137 F   EXIT(so)= 1052 F   SMPL=  833 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #   3   ELAPSED TIME, MIN   3   RECORD ON TRK   1   FILE  56   EXCESS AIR CURVE
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DATE          :     05-09-84                         TER DIA       :     0
SYSTEM        :     LWS                              SPREADER      :     BL CONE
BURNER        :     CCV-50                           B.P/R.H.      :     29.43/47.0
FUEL          :     ILLINOIS3                        OIL CHECK     :     -3.66

                 LOAD                                                               
PT#    TIME   MBTU/HR  TA    PRIM   V-2   V-3   V-4   V-5   V-8   V-7   TOTAL    PRIM  SEC  TER1  TER2  TER3  TER4     PRIM   SEC    TOTAL      O2    CO    CO2    NO    SO2
  OIL           CALC  SCFM                          FLOW SCFM                                FLOW SCFM                       SR (CUM)                           MEASURED
(%)    LOAD     MEAS                                                                         TEMP (F)                                                         CORR TO 0% O2
                                                    TEMP (F)                             VELOCITY (FT/SEC)                                                    CORR TO 3% O2

 357  10:02:46  50.8  8192  1125     0     0     0     0  3721  4690   9535     1125  8411    0     0     0     0      0.14   1.16    1.16       3.0  70.0  16.2  265.0 2800.0
                                                                                143   673    0     0     0     0                                 0.0  81.7  18.9  309.2 3266.7
   0     0.0    50.3         830   272   475   447   354   805   811             86   129    0     0     0     0                                 3.0  70.0  16.2  265.0 2800.0
E-TKON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 673 F    WINDBOX P=16.50IN H2O   FURNACE P= 0.10IN H2O   COAL P=10.00IN H2O
MILL IN=  366 F   MILL OUT= 142 F   EXIT= 1237 F   EXIT(sp)= 1389 F   SMPL=  926 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  1   ELAPSED TIME, MIN   0   RECORD ON TRK   1   FILE  71   BASELINE-ILLINOIS-CCV 50

 395  10:20:20  48.0  7775  1154     0     0     0     0  3829  4763   9746     1154  8592    0     0     0     0      0.15   1.25    1.25       4.3  70.0  16.0  310.0 2560.0
                                                                                142   621    0     0     0     0                                 0.0  88.0  20.1  389.8 3219.2
   0     0.0    50.3         830   284   480   450   362   731   753             88   125    0     0     0     0                                 3.0  75.4  17.2  334.1 2759.3
E-TKON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 621 F    WINDBOX P=16.50IN H2O   FURNACE P= 0.25IN H2O   COAL P= 9.50IN H2O
MILL IN=  340 F   MILL OUT= 141 F   EXIT= 1217 F   EXIT(sp)=  105 F   SMPL=  931 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  2   ELAPSED TIME, MIN   3   RECORD ON TRK   1   FILE  58   EXCESS AIR CURVE

 415  10:29:24  49.6  8030  1133     0     0     0     0  3960  4864   9957     1133  8024    0     0     0     0      0.14   1.24    1.24       4.1  70.0  15.2  300.0 2600.0
                                                                                141   583    0     0     0     0                                 0.0  87.0  18.9  372.8 3230.0
   0     0.0    50.3         828   286   466   448   357   689   708             86   124    0     0     0     0                                 3.0  74.6  16.2  319.5 2769.2
E-TKON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 583 F    WINDBOX P=17.00IN H2O   FURNACE P= 0.45IN H2O   COAL P= 9.20IN H2O
MILL IN=  350 F   MILL OUT= 141 F   EXIT= 1249 F   EXIT(sp)= 1345 F   SMPL=  945 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  3   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  59   EXCESS AIR CURVE

 450  10:44:01  48.4  7846  1128     0     0     0     0  4063  4882  10073     1128  8945    0     0     0     0      0.14   1.28    1.28       4.7  70.0  14.8  310.0 2520.0
                                                                                142   549    0     0     0     0                                 0.0  90.2  19.1  399.4 3246.6
   0     0.0    50.3         823   287   450   436   351   645   663             86   122    0     0     0     0                                 3.0  77.3  16.3  342.3 2782.0
E-TKON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 549 F    WINDBOX P=17.00IN H2O   FURNACE P= 0.45IN H2O   COAL P= 9.20IN H2O
MILL IN=  355 F   MILL OUT= 141 F   EXIT= 1255 F   EXIT(sp)=  226 F   SMPL=  961 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  4   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  60   EXCESS AIR CURVE

 526  11:20:12  50.5  8192  1130     0     0     0     0  3951  4249   9331     1130  8208    0     0     0     0      0.14   1.14    1.14       2.6  70.0  16.6  260.0 2960.0
                                                                                143   594    0     0     0     0                                 0.0  79.9  18.9  296.7 3370.3
   0     0.0    50.3         827   275   439   424   346   704   725             86   117    0     0     0     0                                 3.0  68.5  16.2  254.3 2895.7
E-TKON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION=  -6.0 IN   WINDBOX T= 594 F    WINDBOX P=17.00IN H2O   FURNACE P= 0.45IN H2O   COAL P= 9.20IN H2O
MILL IN=  358 F   MILL OUT= 142 F   EXIT= 1276 F   EXIT(sp)=  191 F   SMPL=  970 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  5   ELAPSED TIME, MIN   2   RECORD ON TRK   1   FILE  61   EXCESS AIR CURVE

 546  11:30:44  48.3  7822  1176     0     0     0     0  3871  4422   9469     1176  8293    0     0     0     0      0.15   1.21    1.21       3.7  70.0  15.6  280.0 2720.0
                                                                                142   607    0     0     0     0                                 0.0  85.0  18.9  339.9 3301.7
   0     0.0    50.3         820   274   444   427   347   719   742             89   119    0     0     0     0                                 3.0  72.8  16.2  291.3 2830.1
E-TKON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION=  -3.0 IN   WINDBOX T= 607 F    WINDBOX P=17.00IN H2O   FURNACE P= 0.45IN H2O   COAL P= 9.00IN H2O
MILL IN=  337 F   MILL OUT= 141 F   EXIT= 1268 F   EXIT(sp)= 1412 F   SMPL=  966 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  6   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  62   SPREADER ADJUSTMENT

 603  11:56:56  49.5  8017  1190     0     0     0     0  3927  4533   9650     1190  8460    0     0     0     0      0.15   1.20    1.20       3.6  65.0  15.4  280.0 2760.0
                                                                                142   622    0     0     0     0                                 0.0  78.4  18.6  337.9 3331.0
   0     0.0    50.3         815   280   456   439   355   740   765             90   124    0     0     0     0                                 3.0  67.2  15.9  289.7 2855.2
E-TKON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION=   0.0 IN   WINDBOX T= 622 F    WINDBOX P=17.00IN H2O   FURNACE P= 0.50IN H2O   COAL P= 0.50IN H2O
MILL IN=  318 F   MILL OUT= 141 F   EXIT= 1285 F   EXIT(sp)= 1375 F   SMPL=  980 F        SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   [Ca]/[S]=  0.00
VALID DATA POINT #  7   ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  63   SPREADER ADJUSTMENT
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DATE          :   05-09-84                      TER DIA/      :   0
SYSTEM        :   LWS                           SPREADER      :   BL CONE
BURNER        :   CCV-50                        B.P/R.H.      :   29.43/47.0
FUEL          :   ILLINOIS3                     OIL CHECK     :   -3.66

             LOAD         PRIN   V -2   V -3   V -4   V -5   V -8   V -7   TOTAL    PRIN  SEC  TER1 TER2 TER3 TER4    PRIM   SEC    TOTAL      O2   CO    CO2   NO    SO2
PT0   TIME   MBTU/HR  TA                        FLOW SCFM                                    FLOW SCFM                      SR (CUM)                           MEASURED
  OIL        CALC   SCFM                                                                     TEMP (F)                                                       CORR TO 0% O2
(%)   LOAD   MEAS                               TEMP (F)                                   VELOCITY (FT/SEC)                                              CORR TO 3% O2

 679 12:37:33  51.5  8354  1139    0     0     0     0    3845   5013   9998    1139 8859  0  0  0  0     0.14   1.20   1.20      3.5  65.0  15.6  330.0 2760.0
                                                                                143  636  0  0  0  0                               0.0  78.0  18.7  396.0 3312.0
   0   0.0   50.3         821   285   460   440   362    757    781              87  131  0  0  0  0                               3.0  66.9  16.0  339.4 2838.9
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION= -6.0 IN   WINDBOX T= 636 F    WINDBOX P=17.00IN H20    FURNACE P= 0.10IN H20    COAL P= 9.50IN H20
MILL IN=  349 F   MILL OUT= 142 F   EXIT= 1303 F   EXIT(sp)= 1412 F   SMPL=  998 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  8   ELAPSED TIME, MIN   7   RECORD ON TRK   1   FILE  64   BASELINE-SORBENT

 822 13:45:07  51.9  8413  1342    0     0     0     0    3851   5108  10301    1342 8959  0  0  0  0     0.16   1.22   1.22      3.9  60.0  15.2  365.0 2720.0
                                                                                140  634  0  0  0  0                               0.0  73.7  18.7  448.2 3340.4
   0   0.0   50.3         766   255   454   444   355    765    793             102  132  0  0  0  0                               3.0  63.2  16.0  384.2 2863.2
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION= -6.0 IN   WINDBOX T= 634 F    WINDBOX P=17.00IN H20    FURNACE P= 0.10IN H20    COAL P= 9.50IN H20
MILL IN=  323 F   MILL OUT= 141 F   EXIT= 1294 F   EXIT(sp)= 1410 F   SMPL=  993 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  9   ELAPSED TIME, MIN   3   RECORD ON TRK   1   FILE  65   BASELINE

 902 14:27:43  53.1  8606  1102    0     0     0     0    3772   5089   9963    1102 8861  0  0  0  0     0.13   1.16   1.16      2.9  60.0  16.2  320.0 2920.0
                                                                                142  642  0  0  0  0                               0.0  69.6  18.8  371.3 3387.0
   0   0.0   50.3         820   249   455   445   354    773    801              84  132  0  0  0  0                               3.0  59.7  16.1  318.2 2903.8
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION= -6.0 IN   WINDBOX T= 642 F    WINDBOX P=16.50IN H20    FURNACE P= 0.10IN H20    COAL P=10.20IN H20
MILL IN=  364 F   MILL OUT= 144 F   EXIT= 1320 F   EXIT(sp)=  407 F   SMPL= 1021 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  11  ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  66   BASELINE

 916 14:34:02  50.7  8221   987    0     0     0     0    3789   5120   9895     987 8908  0  0  0  0     0.12   1.20   1.20      3.6  60.0  15.8  365.0 1860.0
                                                                                139  645  0  0  0  0                               0.0  72.4  19.1  440.5 2244.8
   0   0.0   50.3         826   250   460   447   354    774    803              75  133  0  0  0  0                               3.0  62.1  16.3  377.6 1924.1
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION= -6.0 IN   WINDBOX T= 645 F    WINDBOX P=16.50IN H20    FURNACE P= 0.10IN H20    COAL P=10.20IN H20
MILL IN=  379 F   MILL OUT= 142 F   EXIT= 1319 F   EXIT(sp)= 1442 F   SMPL= 1023 F  SORBENT= VICRON   MILL INJECTION   SORBENT LBS/HR= 500   SORBENT VELOCITY=  75 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  1.45
VALID DATA POINT #  12  ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  67   VICRON INJECTION

 947 14:40:23  48.1  7796   951    0     0     0     0    3795   5143   9889     951 8938  0  0  0  0     0.12   1.27   1.27      4.5  60.0  15.0  430.0 1200.0
                                                                                138  646  0  0  0  0                               0.0  76.4  19.1  547.3 1527.3
   0   0.0   50.3        1049   495   690   440   355    775    805              72  133  0  0  0  0                               3.0  65.5  16.4  469.1 1309.1
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION= -6.0 IN   WINDBOX T= 646 F    WINDBOX P=16.50IN H20    FURNACE P= 0.10IN H20    COAL P=10.20IN H20
MILL IN=  380 F   MILL OUT= 140 F   EXIT= 1300 F   EXIT(sp)=  179 F   SMPL= 1024 F  SORBENT= VICRON   MILL INJECTION   SORBENT LBS/HR= 950   SORBENT VELOCITY=  72 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  2.76
VALID DATA POINT #  13  ELAPSED TIME, MIN   3   RECORD ON TRK   1   FILE  68   VICRON  INJECTION

 977 15:02:57  47.2  7648  1004    0     0     0     0    3815   5120   9939    1004 8935  0  0  0  0     0.13   1.30   1.30      4.9  50.0  14.2  380.0 1980.0
                                                                                136  640  0  0  0  0                               0.0  65.2  18.5  495.7 2582.6
   0   0.0   50.3         820   252   450   440   354    774    803              76  133  0  0  0  0                               3.0  55.9  15.9  424.0 2213.7
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION= -6.0 IN   WINDBOX T= 640 F    WINDBOX P=16.50IN H20    FURNACE P= 0.10IN H20    COAL P=10.20IN H20
MILL IN=  378 F   MILL OUT= 138 F   EXIT= 1281 F   EXIT(sp)= 1411 F   SMPL= 1060 F  SORBENT= VICRON   MILL INJECTION   SORBENT LBS/HR= 310   SORBENT VELOCITY=  76 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.90
VALID DATA POINT #  14  ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  69   VICRON INJECTION

1008 15:19:17  51.7  8305  1090    0     0     0     0    3778   5119   9988    1090 8898  0  0  0  0     0.13   1.19   1.19      3.4  60.0  15.6  330.0 2800.0
                                                                                133  652  0  0  0  0                               0.0  71.6  18.6  393.7 3340.9
   0   0.0   50.3         822   248   459   440   353    790    821              83  133  0  0  0  0                               3.0  61.4  16.0  337.5 2863.6
K-TRON=5000 LBS/HR    REGISTER POSITION=  20 DEG   SPREADER POSITION= -6.0 IN   WINDBOX T= 652 F    WINDBOX P=16.50IN H20    FURNACE P= 0.10IN H20    COAL P=10.20IN H20
MILL IN=  359 F   MILL OUT= 139 F   EXIT= 1314 F   EXIT(sp)= 1456 F   SMPL= 1021 F          SORBENT LBS/HR=  0    SORBENT VELOCITY=  0 FT/SEC   SORBENT AIR FLOW=   0  SCFM   (Ca)/(S)=  0.00
VALID DATA POINT #  15  ELAPSED TIME, MIN   5   RECORD ON TRK   1   FILE  70   BASELINE
```

DATA SUPPLEMENT FOR CCV 100 ON 4-18-84 WITH UTAH COAL

DATE	BURNER	DATA PT. # ON VALID SUMMARY	O_2 (%)	SO_2, ppm (@ 0% O_2)	SORBENT	INJECTION LOCATION	Ca/S	CAPTURE (%)
4-18-84	CCV 100	452	3.8	622.7	---	---	---	---
4-18-84	CCV 100	483	3.9	319.0	Vicron	Mill	3.04	48.6
4-18-84	CCV 100	520	3.9	368.0	Vicron	Mill	2.18	40.7
4-18-84	CCV 100	---[1]	4.0	617.6	---	---	---	---
4-18-84	CCV 100	558	3.9	393.0	Vicron	Mill	1.42	29.1
4-18-84	CCV 100	---[2]	3.9	491.0	---	---	---	---

NOTES: 1 - Used as final baseline for sorbent points 452 and 520 as taken off strip chart. Not included in Valid Data Summary. Time of Baseline = 12:02.

2 - Used as final baseline for sorbent point 558. Time of Baseline = 12:24.